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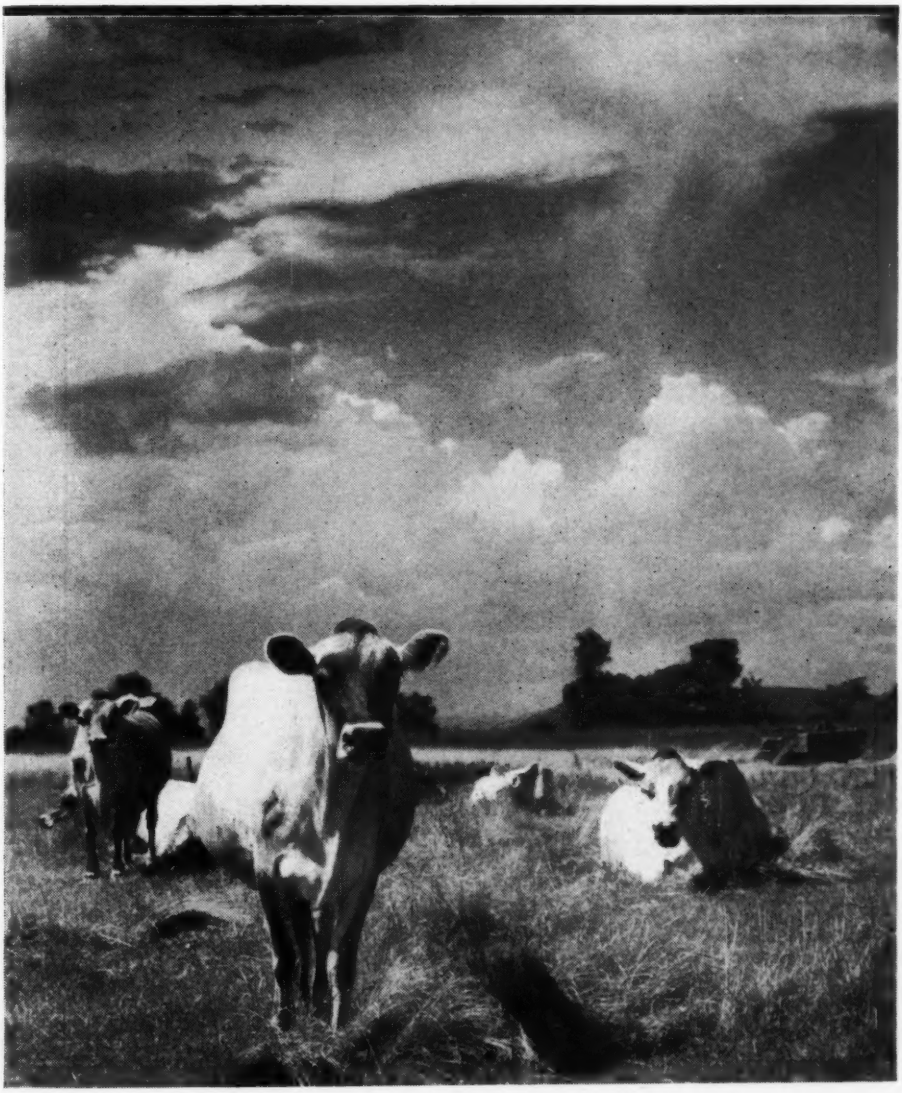

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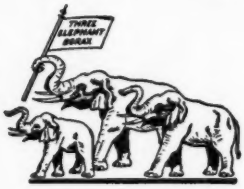

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The Whole Truth—Not Selected Truth

R. H. STINCHFIELD, *Editor*

Editorial Office: 1155 16th Street, N. W., Washington 6, D. C.

VOLUME XXX NO. 7

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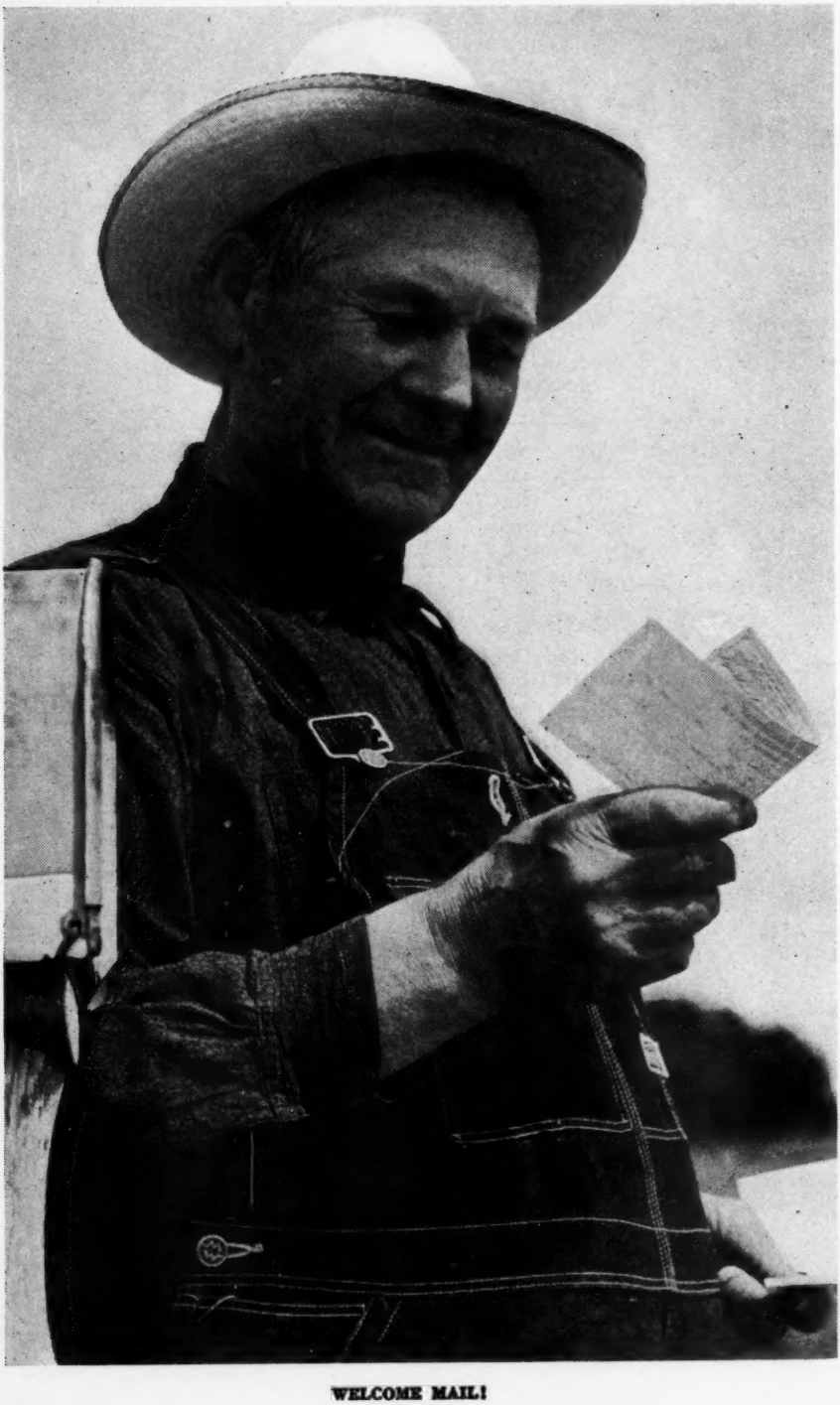

WELCOME MAIL!

Better Crops with PLANT FOOD

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VOL. XXX WASHINGTON, D. C., AUG.-SEPT. 1946 No. 7

Science Goes Into . . . . .

FERTILE DIRT

Jeff McDermid

MY earliest recollection of fertilizing a farm brings visions of a one-horse, light-draft rickety wagon drawn by a gray gelding named Pike, and driven by a determined but rather inefficient operator, (in the modern version) who called me "Sonny." The accumulated heaps of excreta and straw bedding which required daily removal from the stalls of Pike and his stable-mate, a ring-streaked hybrid cow of the original boarder class, were forked up in fibrous chunks in the early spring and loaded on the gunwales of our galleon with many a grunt and backache.

Of course we had no handy contrivance of wheels, chains, and sprockets to hook into and scatter the refuse to the far winds of the field, so the odorous load was twice handled. The Boss used to say that our "critters" were good consumers of grain and hay and A-1 producers of intestinal residues, but he objected to having the task of lifting so much tonnage in and out for them at so little net profit. With a sense of justice, he thought the old cow should be hitched to the wagon with Pike to help in the hauling.

He had never discussed scientific manurial matters with the leading soil savants of his day, but he was confident that if one just used his nose he could pick a useful commodity for soil enrichment, and the only thing then left to do was to get that strong scent as far away from the house as possible and well plowed under before hot weather.

His era was that of the pioneers. They trusted to their sense of smell to

find things most suitable for burying and their sense of sight to detect values gained from such deposits of decayed effluvia. They knew also something of the worth lying in green-manuring of herbage, the virtue of fallowing, and the strength which followed a system of crop rotation. They learned indirectly about the desirability of liming land from occasional green spots of corn and oats growing on the graves of deceased farm animals. But they had no contacts with the few farm colleges then existing, and most agricultural journals relied on practical farm experience for tips and suggestions.

HERE and there nursery and seed catalogs offered sample lots of commercial plant food, but there was no unified effort to banish mystery and penetrate new fields which would multiply the use of and reduce the cost of prepared balanced fertilizers. It seems to me we used a little fertilizer once on some garden vegetables, but the expense and the effort of ordering it offset the apparent advantage. So the folks said it was a fancy fad and stuck to the manure pile. There never was enough of it to go around, however. So they too often depended on luck instead of lime and relied on "fate" instead of fertilizer.

Farmers, however, were not alone in their disregard of mixed goods for soil improvement. I recall hearing agronomists out in the Midwest, full of zeal and short of facts, say repeatedly that the lime-manure-legume-phosphate program was all-sufficient. Some few forward ones wondered if there might not be a different answer for worn-out topsoils and began some local and state cooperative experiments. They located progressive farmers with open minds willing to test the new theories if it didn't cost them anything but the risk of "losing a crop." Plots were staked out and fertilized, signs were put up for the public to heed in passing by, and harvest checks were made for review at sundry winter institutes.

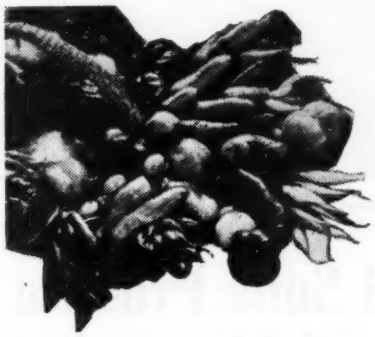
This must have borne fruit, if we go by the statistics on usage of commercial fertilizers. Official dope has it that the tonnage of plant food used on our farms in 1945 was at least 270 per cent of the trickle that reached tired soils in 1915. Men in my bailiwick who scoffed at mineral replenishment of the land have fallen into step long ago and reckon on an annual outlay for fertilizers as normally as they do for seed and binder twine. Instead of being regarded as a nifty new racket, second only to the worthless offerings of the patent medicine sachem and the lightning-rod purveyors of the times, soil-bank builders are accepted today as reliable advisers on procedure for production.

Private estimates based on reports of over 12 million tons of fertilizing materials spread in 1944 indicate that this year optimistic and production-zealous farmers have used close to 15 million tons all told. The thousand or more different grade formulas which were in the picture in 1940 have dwindled to about 260, which is probably a forward step likely to build confidence and avoid confusion and misdirected effort. Along with this there has been a corresponding gain in the plant-food content found in the commercial offerings of mixed goods, from an average of about 14 per cent to nearly 22 per cent, accompanied by a better physical condition when received by the growers.

THIS has been caused by teamwork. Credit for these progressive improvements belongs to the farmers themselves whose kicks and complaints lodged in the right hands; to the county agents and college specialists, as well as the fertilizer agents and field men, who reported results and reviewed opinions; to scientists in states and federal laboratories who took apart the faults when found and made them tick; and to the manufacturers who built better business on the strong foundation of satisfied customers and bumper crops in times of need. I believe the old em-

pirical and speculative period for the industry has vanished with the husking-peg and the ox-yoke. Hereafter judicious attitudes toward a necessity will replace haphazard guessing about a luxury.

IF the farm papers 25 years ago had carried warnings of impending scarcity of commercial plant food, few rural brows would have furrowed in



perplexity and dismay. Today when a world shortage of many vital fertilizing ingredients appears, it is looked upon as a major calamity. This has not been caused simply by skillful advertising or wordy repetition. Its reason lies in personal farm experience.

It is often said that agriculture is usually "in the middle of some muddle." If so, the end of a war era does not bring much relief from that customary quandary. Yet, however, the program runs or whatever the end result may be, either scarcity or surplus, the farmer must rely on soil fertility to pull him through safely.

We all know how that happens and why. If the country should achieve a good long spell of industrial prosperity and sustained wage earnings by the masses who consume the grub, it will spur the food producers to seek greater total production of crops, pasture, and livestock products. To get this goal, there must always be a sound program of fertility—erosion control, irrigation, liming, manuring, plow-down crops, and restoration of mineral plant food. Less land will lie idle, more land will be worked overtime, and good top-soils will be tapped. Perhaps some questionable land and livestock will be used from a net profit angle, but folks lose sight of that in years of fat markets.

If, on the contrary, the cycle of inflation and underconsumption should wreck our immediate hopes for prosperity in peacetime, the farmer begins to ponder on higher production, too, in self defense. No matter if individual projects in that direction cause a combined surplus somewhere and prices are depressed—the urge to make each acre count to accumulate enough tonnage to offset the lower price—it will still be with us. That, too, argues for no great decline in the demand for additional plant food. History rather proves the case. In the depression years of 1932-34 inclusive, our farmers bought an average of 5.2 million tons of commercial fertilizers compared with about 7.5 million tons in the three years both preceding and succeeding that gob of woe. That was no great shakes of a slump after all.

Hence no huge reconversion cut-back is facing fertilizer people now. One thing that will hold it firm is the general hunch so many farmers have that maintenance of the soil is a long-time program, not just a short heat to be run with an acre or two of specialty crops in boom years.

I DO not know of any case where we can demonstrate the united effort of the white-collar and the sweatshirt boys in meeting a crisis like we can with the war food campaign. Managers of implement and fertilizer factories in the winter of 1941-42 found themselves facing a huge wave of keen demand from the dirt farmers. The working force of these firms making tractors, plows, fertilizer distributors, and mixed fertilizer was disrupted by the call for man-power in the armed services and

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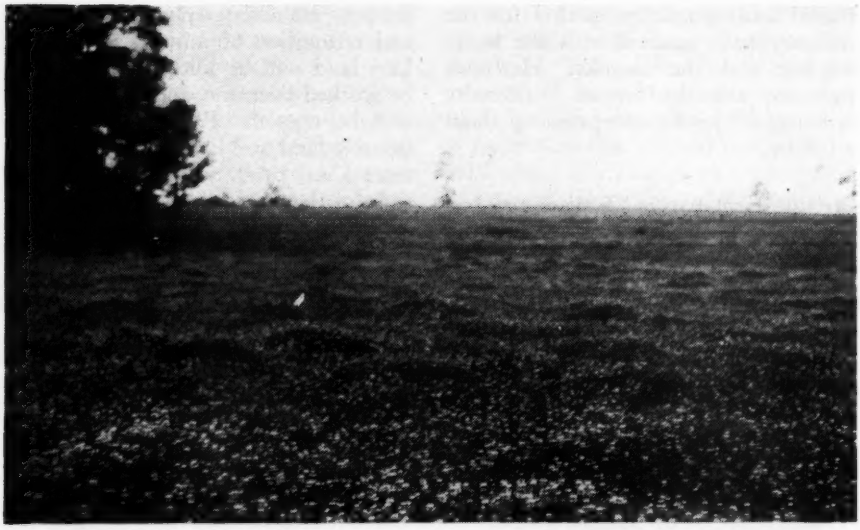


Fig. 1. Excellent pastures are produced on rolling sandy land when minerals are used.

South Mississippi Soils Produce Fine Pastures and Livestock When Minerals are Applied

By H. B. Vanderford

Department of Agronomy, Mississippi State College, State College, Mississippi

THE farmers of South Mississippi are producing livestock without blemishes or nutritional deficiencies by applying the essential minerals to their soils. Their experience, under the direction and guidance of Soil Conservation Service technicians and other agricultural leaders, has shown definitely that improved pastures can be developed on soils that were once thought poorly adapted for pasture crops.

This belated program has taken root and expanded considerably in Walthall County. The agricultural workers in this County have made use of the recommendations of the Mississippi Experiment Station and the results of the pasture work in the State of Louisiana. The basic principle behind this remarkable and important development in pasture improvement and quality of livestock produced is that adequate minerals have been added to the land. This story strongly re-emphasizes the truth that was brought to our attention often during the war and has been stressed considerably during recent years: "Fertile land produces healthy plants and in turn healthy animals" or conversely "poor land produces sick plants or plants low in nutrients and consequently sick animals."

Extensive livestock production always has been associated with soils containing adequate mineral supplies, and probably always will be. Many disap-

pointments have been experienced in trying to develop improved pastures on soils without natural or applied fertility. Farm operators who desire to develop good pastures on soils deficient in minerals must certainly consider the extra cost of applied fertility necessary for the production of nutritious pasture plants and healthy livestock. Even at the present high price levels, minerals bought in a sack and applied to pasture land are proving to be good investments in many localities. Money invested in minerals that are applied to pastures is returning to many farmers of South Mississippi high interest rates in terms of pastures and livestock that were once thought to be nearly impossible and certainly impracticable in this area. There are many acres in this section of the State now covered with luscious white dutch clover and dallis grass that are carrying healthy livestock the greater part of the year. One pasture, in Walthall County, properly fertilized and seeded, 25 acres in size, furnished plenty of grazing for 50 head of beef cattle for a period of 10 months in 1945. This is quite a contrast to the usual pasture which has been common in this section where several acres have been required to maintain one cow.

History of Program

The pasture program was initiated in Walthall County by D. M. Fortenberry, District Conservationist with the Soil Conservation Service. Mr. Fortenberry as soon as he came to the county converted a few farmers on the idea that pastures could be developed on the soils that comprised their farms, and several operators were willing to try his plan. The first pastures were prepared, fertilized, and seeded in the fall of 1942. In the spring of 1943 these pastures served as demonstrations for several other farmers as well as for visitors from other counties. With the shortage of labor that was encountered about this time, the farmers were ready to turn to other farming practices which required less labor than "king cotton." More pastures and livestock seemed to be the correct solution to the problem.

In the development of improved pasture, Fortenberry stressed two fundamental necessities. First, the land must be well prepared in time to seed clovers and grasses in early October. Good

Fig. 2. Poor pastures on similar soil conditions as shown in Fig. 1. The vegetation is sparse and several acres are necessary to support one cow during the summer. No winter or early spring grazing is obtained.

preparation, although expensive, is absolutely essential. Said Fortenberry, "It is foolish to pay a dollar per pound for seed and then put them on poorly prepared land." High-priced seed of pasture plants should always have the advantage of a well-prepared seedbed. Good land preparation is illustrated in figure 5. Successful farmers never expect row crops to grow off and produce well when planted on rough or poorly prepared land. If this is true for row crops, it is also true with regards to pasture crops.

The second prerequisite was that adequate minerals such as calcium, potassium, and phosphorus must be applied and worked into the soil prior to seeding. These minerals could be added in the form of agricultural limestone, muriate of potash, and superphosphate, or basic slag and muriate of potash. The results of the first demonstrations where adequate minerals were used were outstanding and many visitors were sold on the idea that pastures could be developed when the land is properly prepared and sufficient minerals added. Of course, the management and utilization were to be worked out later, but the ground floor of an important pasture program had been established.

Soils of Walthall County

There is an old adage to the effect that "in order to be successful in life, a person should be very careful in choosing his grandparents." The present farmers and operators of Walthall County are fortunate enough to have had grandparents who settled on land with excellent physical properties, and as a result they inherited good soils. Walthall County lies entirely in the Coastal Plain Province, but a thin mantle of loess has influenced the soils in several places. This thin mantle of loess has been removed from many of the soils on the rolling and steep topography by accelerated erosion. The Coastal Plain material is rather fine-textured and is somewhat unusual for marine material. The material resembles somewhat the deposits found in the Pontotoc Ridge Area. The upper strata are composed of sand and clay with a high percentage of silt. This extends to a depth of several feet, which would seem to preclude the idea that the silt found in the soils is altogether of wind-blown origin. In some places where the topography is level to gently rolling, a definite loess deposit which has had a definite influence on the soils is found. However, where this loess material cannot be detected, the soils possess a fine texture compared with other Coastal Plain soils. This property of the soils enables them to hold moisture and fertilizers for extended periods of time.

Many variations occur among the soils of Walthall County, but in general they are deep, well-drained soils with medium textures. All of these soils characteristics are favorable for the production of most agricultural crops. These soil properties have played a major roll in the development of the highly intensified type of agriculture that has been common in this County for many years. Some of the predominant upland soils of the County are Ruston, Luverne, Shubuta, and Ora which developed from Coastal Plain material, and in areas where loess overlies the Coastal Plain material, the Providence, Lexington, Bude, and Brandon soils which have silty textures are found. Many of the soils contain a considerable quantity of gravel but few are droughty from excessive internal drainage. The physical properties of the soils have in the past been considered highly favorable for row crops and less favorable for livestock production and diversified farming. The soils in general are low in natural minerals, and pasture development on soils deficient in minerals was once considered too expensive to be profitable. The present results, however, indicate that desirable physical properties of these soils may have a decided advantage in the growth of pasture plants as well as cotton or corn.

Fig. 3. Soil fertility is a controlling factor. The portion of this field on the right received basic slag and potash. The part to the left was prepared and seeded but no minerals were added.

Progress of Pasture Program

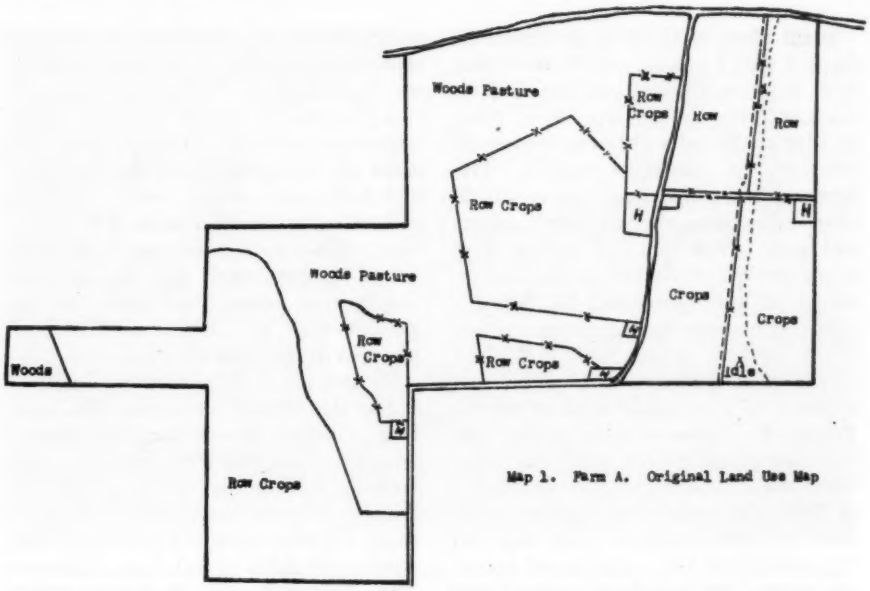
By using the original demonstrations as guides and making some improvements on the original plan, many farmers in Walthall and adjoining counties have elected to devote many acres on their farms to pasture crops. At the present time a panorama of white dutch clover blooming in promiscuous profusion is observed on many farms in Walthall County. Pasture demonstrations were conducted on 70 farms in that County this year in which a complete fertilizer was tested in com-

Fig. 4. Same scene as shown in Fig. 3 after two months of heavy grazing. Cattle grazed the fertilized part and left the unfertilized part. The cattle refused to eat the grass from the unfertilized plot.

Fig. 5. Good preparation is one of the necessary prerequisites for pasture development.

parison with lime and phosphate. In Walthall County alone a carload of potash was used in demonstrations during one year in the development of improved pastures. The program has advanced to the point where all the agricultural leaders and many farmers in that County are stressing the fact that crops which can be harvested by animals instead of hands and machines are what are needed. Good cotton land that once produced a bale of cotton per acre, with high fertilization, is now making more income growing excellent pastures that are being harvested by beef and dairy cattle. This type of farming blends nicely into the Soil Conservation Program, since most of the land is continually in pastures or close-growing crops which reduce the loss of

Fig. 6. Adequate minerals produce a good pasture comprised of a mixture of grasses and clover.

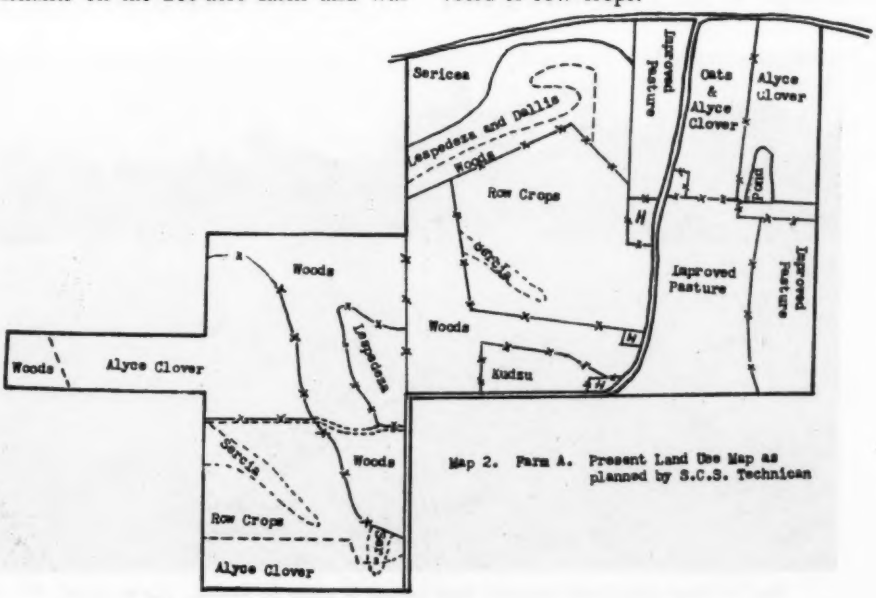


Map 1. Farm A. Original Land Use Map

fertility and soil by accelerated soil erosion.

Some Typical Examples

The following is an example of how one farmer changed his type of farming and how well the new plan is working. In 1943 this particular farmer had five tenants on his 260-acre farm and was growing approximately 60 acres of cotton. There was not an acre of improved pasture on the entire farm. In the fall of 1943, he signed an agreement with the Soil Conservation Service, and Mr. Fortenberry devised a farm plan which indicated more pastures and close-growing crops and less acreage devoted to row crops.



Map 2. Farm A. Present Land Use Map as planned by S.C.S. Technican

Farm plans of farm A are shown in maps 1 and 2. It is well to note that there were only wood pastures and no stock or fish pond on farm A in 1943. In 1946 we found a different picture on this farm as shown in map 2. The farm was being operated with very little labor other than the operator's efforts and only a few acres of cotton were being grown. Only one tenant was retained on the farm, and he, being a negro, was growing the cotton. Most negro farmers would feel that their religion was questionable if they failed to plant at least a few acres of cotton. Twenty-five acres of good cotton land were prepared and seeded to white dutch clover and dallis grass in the fall of 1943. Minerals were supplied in the form of 2,000 pounds of basic slag and 200 pounds of 50% muriate of potash per acre. An excellent pasture was produced in the spring of 1944. Since that time 1,000 pounds of basic slag and 50 pounds of muriate of potash per acre have been applied each fall.

This farmer was so well pleased with the results of his efforts that since 1943 he has changed the farm to the outlay shown in map 2. The crops have been arranged so that a year-round grazing program can be practiced. It can be observed from map 2 that several fields are devoted to oats and alyce clover, and small patches are planted to kudzu and lespedeza sericea. During 1945, 25 acres of improved white dutch clover and dallis grass pasture carried 50 head of beef cattle for 10 months during the year. The farmer estimated that he netted approximately $50 per acre on this pasture during that year. At the present time this is one of the best pastures in the State of Mississippi.

By managing this enterprise according to the present farm plan this operator expects to obtain year-round grazing in the following manner: Oats with the addition of crimson clover will be grazed from November 15 to February 15; then improved pasture (white clover and dallis grass) from February 15 to August 1; then alyce clover from August 1 to November 15. The patches of kudzu and sericea are for hay and emergency grazing in case of adverse weather conditions and if extra grazing is needed. It is fully realized that good pasture management must provide for controlled grazing. This is one of the paramount factors in the establishment

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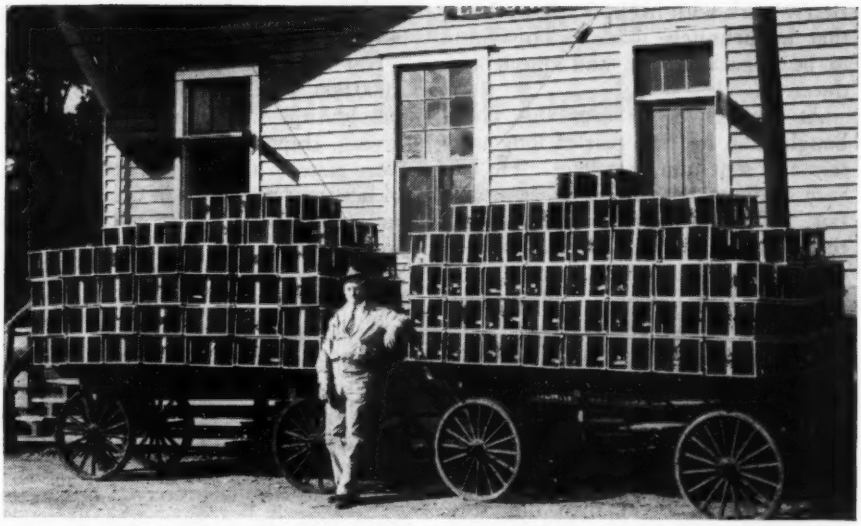
Fig. 7. Good cotton land produces high income in terms of pastures and livestock.



W. E. Harrell standing with $1,200 worth of package bees at the railroad station at Letohatchie, Alabama, awaiting the 4:00 o'clock train. Most of these bees are addressed to honey producers in Saskatchewan and Ontario Province in Canada.

Meet the King of Queens

By L. O. Brackeen

Agricultural Extension Editor, Alabama Polytechnic Institute, Auburn, Alabama

ON small parcels of rented land in seven Alabama and Florida counties, W. E. Harrell, Hayneville, Alabama, operates the largest individually owned package bee and queen empire in the world. His friends call him the "King of Queens".

Each year he ships some 40,000 queens and 150,000,000 honeybees. This is enough queens to lay 6,000,000,000 eggs and enough bees to serve as foundation stock for producing 2,000,000 pounds of honey the same year they are shipped. In addition, they cross-pollinate thousands upon thousands of acres of fruit trees, clover fields, and vegetable patches.

Harrell has perfected his operations to the extent that his bee and queen kingdom is being used as a Laboratory by his Alma Mater, the Alabama Polytechnic Institute. College students, both boys and girls, visit the queen and bee yards at regular intervals and make queen cells, gather royal jelly, catch and plant larvae, place cells in colonies, catch and cage queens, and shake and ship package bees. They report some "unforgettable experiences."

Too, each year he has visitors from all over North America and an occasional visitor from South America and Europe. The government of Norway this year asked that a student be permitted to work two years with Harrell "learning the bee and queen business."

It was 32 years ago that Harrell started on the road to fame in the bee world. As a barefoot lad on his father's farm, he used to stand fascinated for hours watching his neighbor, M. C.

Berry, work with his bees. It was then that he definitely made up his mind to be a package bee and queen producer.

At the age of 16 years his father bought him his first pair of long trousers and sent him to college. He was very studious, but his grades were only fair. This was attributed to the fact that he was more interested in bees and queens than academic learning. His professors and fellow students labeled him "the bee man."

After graduating from Alabama Polytechnic Institute in 1919, he went back home and began working for Berry without pay "just to learn the trade." Seeing his interest, Berry gave him a job. He worked as a hired hand for one year. Berry then moved to Montgomery and placed Harrell in charge, giving him one-half the returns.

Two years later Harrell borrowed $1,000 for down payment and bought all of Berry's bees agreeing to pay the remainder in monthly installments. From that day until this he has been busy buying bees and extending his bee empire until it now includes 73 outyards in Dallas, Wilcox, Lowndes, Covington, Coffee, and Escambia counties in Alabama, and Santa Rosa county in Florida, and two big queen yards at Hayneville in Lowndes County. Today the queen yards are known as Heaven's Hill and Brewer's Cove.

Each bee yard derives its name principally from local people and places. For example, the Smith, Jones, Johnson, and Morgan yards are named for people, the Dairy yard for a nearby dairy, the Birmingham and Auburn yards for a city and town.

Not only do his bees wing over 2,000,000 acres of forest and farm land, but Harrell holds the distinction of having shipped bees and queens to every state in the United States and to all but three provinces in Canada. The bulk of his bees goes to Michigan, Illinois, Indiana, Ohio, North Dakota, South Dakota, Minnesota, Virginia, West Virginia, Kentucky, Tennessee, and Missouri in this country and the provinces of Saskatchewan, Manitoba, Ontario, and Quebec in Canada. Too, he ships them to England, France, Africa, Belgium, Holland, Thailand, Quatemala, Mexico, and Cuba.

For years he has received orders for more bees and queens than he could possibly supply. Although he is a strong believer in advertising, he hasn't

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W. E. Harrell taking a queen bee from the mating colony and placing it in a small cage used in shipping queen bees. After placing the queen in the cage he catches 6 to 12 worker bees and places them with the queen to feed and fan her during trip from the queen yard to destination.

Trends in Use of Major Plant Foods

By M. H. Lockwood

President, National Fertilizer Association, Washington, D. C.

AS agriculture ages and intensifies, the ratio of phosphorus to nitrogen and potash, in applied fertilizers, narrows. For the United States, nitrogen has increased from 20 to 24 per cent of the three major nutrients during the 24 years following 1920. During the same period, phosphoric acid decreased from 58 per cent of the total to 51, and potash has increased from 22 to 25 per cent.

For commercial distribution only, these trends are even more evident, for government distribution has been principally phosphatic. (See Table 1, both sections.)

New areas of extensive agriculture usually begin fertilizer use with phosphates, and progress toward the three-factor ratios. Increasing rates of application as well as narrowing ratios of nitrogen and potash to phosphoric acid occur as (1) time passes and, (2) agriculture grows more intensive and, (3) returns per acre increase. In some instances, areas of heavy repeated fertilizer use accumulate substantial reserves of available phosphoric acid. Decreases in prices of nitrogen and potash have also been important factors in increasing their use. Prices for phosphates have declined little during the past 20 years.

The national trend upward in nitrogen ratio is masked somewhat by the increasing proportion of our national volume used in the grain-growing areas where a low ratio of nitrogen to minerals is customary. Such areas have clung for years to such grades as 2-12-6 commonly applied at low rates per acre. Fortunately, leaders among both agronomists and industry are courageously converting such practices to narrower ratios and heavier rates more easily defended under today's conditions and knowledge.

Improved methods of application have played no small part in greater fertilizer use. With both "starter" or "beside the row" application and the newer "plow down" or "heavy" application methods, nitrogen and potash are wisely placed where they may work more efficiently. Fortunately, too, the salt index of nitrogen and potash carriers used has decreased as higher analysis materials have increased in use. The decreased use of low analysis potash salts is one of the best illustrations of this as well as the effect of lower unit costs for higher analysis ingredients.

Trends in Regions

Because grand averages for the nation may have in them the confusing effect of unlike area practice, let's take a look at a few different sections of the country.

The historically heavy fertilizer-using state of North Carolina is a convenient place in the Southeast for a beginning. In the 10 years since 1935, the popular 3-8-3 has been replaced by 3-8-5 and 3-9-6, as well as 4-10-6, grades. Such a trend seems constructive from the point of view of displacement of grades unduly dilute. While this change was aided in recent years by state and federal regulations, material progress in shrink-

ing the volume of dilute grades was effected earlier by constructive educational effort. North Carolina authorities credit much of that State's progress from a 15-unit 1937 record to 18.8 units in 1944-45 to regulatory control. They also state that heavy accumulations of phosphoric acid in some soils indicate a need for lower applications of that nutrient for more economic fertilization under some conditions in that state. I do not agree that progress by mandatory grade limitations is an acceptable substitute for voluntary educational methods. I do recommend that industry follow such findings as the evidence supporting lower phosphate applications such as the North Carolina Station suggested.

TABLE 1, SECTION 1.—TRENDS IN PLANT NUTRIENT USE, UNITED STATES COMMERCIAL DISTRIBUTION

Factor	1920	1925	1930	1935	1940	1944
Nitrogen	3.12	3.66	4.47	4.77	5.13	5.38
Phosphoric Acid	9.05	9.12	9.41	9.13	9.21	9.84
Potash	3.53	3.79	4.20	4.70	5.33	5.55
Total	15.70	16.57	18.08	18.60	19.86	20.77

INDEX

Factor	1920	1925	1930	1935	1940	1944
Nitrogen	20	22	25	26	26	26
Phosphoric Acid	58	55	52	49	47	47
Potash	22	23	23	25	27	27
Total	100	100	100	100	100	100

TABLE 1, SECTION 2.—ALL DISTRIBUTION, INCLUDING GOVERNMENT

Factor	1920	1925	1930	1935	1940	1944
Nitrogen	3.12	3.66	4.47	4.77	4.85	5.02
Phosphoric Acid	9.05	9.12	9.41	9.13	10.57	10.47
Potash	3.53	3.79	4.20	4.70	5.05	5.15
Total	15.70	16.57	18.08	18.60	20.47	20.64

INDEX

Factor	1920	1925	1930	1935	1940	1944
Nitrogen	20	22	25	26	24	24
Phosphoric Acid	58	55	52	49	52	51
Potash	22	23	23	25	24	25
Total	100	100	100	100	100	100

TABLE 2.—SOUTHEASTERN TREND
(VIRGINIA, NORTH CAROLINA, SOUTH CAROLINA, GEORGIA, AND FLORIDA)

Factor	1920	1930	1940	1943
Nitrogen	18	18	28	24
Phosphoric Acid	61	56	43	45
Potash	21	26	29	31
Total	100	100	100	100

During the past two years, numerous North Carolina demonstrations of corn fertilization have indicated the practicability of doubling the yield of that crop with heavier fertilizer use including all three of the major plant nutrients but with emphasis on nitrogen. Cummings and Collins estimate that 50,000 tons of additional nitrogen will be required to accomplish this doubling feat on corn yields. Pasture improvement now well started in North Carolina will require substantial quantities of phosphates and potash as well as lime.

In Florida, Dr. A. F. Camp and his associates working closely with the fertilizer industry have done a spectacular job in stepping up the citrus yield and quality by proving that minor elements were needed to more than triple the grapefruit and orange volume as has been done during the past decade. Here is a case where nitrogen, phosphorus, and potash were not the first limiting factors, even though important. Magnesium, manganese, copper, zinc, and sometimes boron and iron have their place in the Florida citrus fertilizer program.

The South Atlantic Coastal States (Table 2) Florida to Virginia, inclusive, increased in potash ratio during the 1920 to 1940 period from 21 to 29 per cent, and decreased during the same period in phosphoric acid ratio from 61 to 43 per cent. At the same time, the nitrogen ratio in those five states gained from 18 to 28 per cent of the total for the three major nutrients.

In Alabama, the promotion of the 6-8-4 grade in place of lower nitrogen ratios is well known. The record of this trend appears to have been submerged, however, (when we study Table 3) possibly by government distributed phosphate used on crops other than cotton.

California is notably a heavy user of nitrogen but finds that with two to three times the quantity of nitrogen as is used in Florida, the quality of California citrus is declining. Indica-

TABLE 3.—ALABAMA

Period	Ratio of Major Nutrients			Total Nutrient Quantity Trend
	Nitrogen	Phosphoric Acid	Potash	
1935–1939 Average	31	46	23	100
1940	30	49	21	119
1941	32	48	20	121
1942	25	55	20	126
1943	24	55	21	156
1944	29	52	19	162

TABLE 4.—(NORTHEAST—NEW ENGLAND & MIDDLE ATLANTIC)

Period	Ratio of Major Nutrients			Total Nutrient Quantity Trend
	Nitrogen	Phosphoric Acid	Potash	
1935–1939 Average	17	54	29	100
1940	15	59	26	116
1941	14	60	26	134
1942	13	58	29	140
1943	14	56	30	148
1944	17	55	28	156

tions from field tests in California point toward minerals as being needed with nitrogen. From 1920 to 1943, the nitrogen used in the three west coast states increased from 28 to 50 per cent of the three major nutrients, while phosphoric acid decreased from 53 to 35 per cent, and potash increased from 19 in 1920 to 30 per cent in 1930, dropping back to 15 per cent by 1943.

The Northeast (Table 4) has narrowed its ratio of phosphoric acid to nitrogen and potash during the past quarter century. In that area of three-century farmed land, there is still room, however, for much more phosphate to be used with farm manures before reasonable efficiency in the use of those manures will be attained. Table 4 does not indicate much change in the Northeast, however, during the past 10 years.

In our area survey of the nation, we may well end in the grain belt, livestock-legume states of the Midwest where recent years have witnessed rapid increases in fertilizer use matched by no other section (Table 5).

The ratio of nutrients in the Midwest is so near 1-6-3, except as the shortage of nitrogen depressed that factor in 1942 and 1943, that the pre-

TABLE 5.—EAST AND WEST NORTH CENTRAL STATES

Period	Ratio of Major Nutrients			Total Nutrient Quantity Trend
	Nitrogen	Phosphoric Acid	Potash	
1935–1939 Average	10	62	28	100
1940	9	61	30	130
1941	9	61	30	149
1942	5	63	32	201
1943	7	63	30	213
1944	9	61	30	253
Compare the above with the Continental United States Trends below.				
1935–1939 Average	24	50	26	100
1940	23	53	24	120
1941	23	53	24	132
1942	19	55	26	145
1943	20	53	27	168
1944	24	51	25	179

dominance of the 2-12-6 grade is evident. As soon as an improved balance of supply and demand develops, the ratio of nitrogen and potash should increase in that area. Such a development need not depress the volume of phosphates used, for still greater fertilizer use may be expected in the corn belt. In spite of the fact that 1944 fertilizer consumption in the Midwest reached two and one-half times the 1935-1939 average, certainly nitrogen and potash and perhaps even phosphoric acid were insufficient in quantity to satisfy the rapidly growing demand there.

In a legume-livestock section such as the Midwest, the production of legumes lessens the purchased nitrogen needed and tends to increase the potash requirement. Even so, with deep placement of heavier applications of nitrogen, in which some states in the Midwest have already made substantial beginnings, there is the likelihood that the present low ratio of nitrogen to minerals may be narrowed. During the years 1943-1944, there obviously was less potash available for use in commercial fertilizers in the Midwest than would have readily been purchased, even though special allocations were made favoring that area as against other sections of the nation. Increased use of fertilizers in the Midwest will affect the national trend more as the area volume grows (See also Tables 11 and 12). Anyone who likes to play with figures can have a lot of fun as well as dig out much of value using the tables in U. S. D. A. Plant Food Memorandum Report No. 11, and A. L. Mehring's article in the August 1945 issue of the Journal of the American Society of Agronomy, studying the trends in states, regions, and the nation.

Trends in Mixtures and Materials

A. L. Mehring of the U. S. Department of Agriculture, discussing "Fertilizer Nitrogen Consumption" in the March 1945 issue of Industrial and Engineering Chemistry, shows that in the period from 1925 to 1940, nitrogen purchased in mixtures increased from 45 to 49 per cent of the total while nitrogen distributed unmixed decreased conversely (See Table 6). Table 6 of Mehring's article indicates that (1) natural organics decreased from 25 to 12 per cent of the fertilizer nitrogen supply, (2) while ammonia and its solutions increased from 0 to 13 per cent during the same 15-year period. In mixtures for the same period, solid nitrates decreased from 10 to 5 per cent of the nitrogen total, while solid ammonium salts increased from 13 to 20 per cent of that total.

TABLE 6, SECTION 1.—NITROGEN IN MIXED FERTILIZERS

Form	1925	1940
Solid Nitrates	23	10
Solid Ammonium Salts	20	41
Natural Organics	37	15
Synthetic Organics	11	9
Ammonia and its Solutions	0	25
Total	100%	100%

TABLE 6, SECTION 2.—NITROGEN TOTAL—MIXTURES AND MATERIALS

Form	1925	1940
Solid Nitrates	39	32
Solid Ammonium Salts	31	35
Natural Organics	25	12
Synthetic Organics	5	8
Ammonia and its Solution	0	13
Total	100%	100%

Let's see how, for the same 15-year interval, the nitrogen used in fertilizers changed in form (Table 6).

Obviously, the trend is away from natural organics and solid nitrates toward the lower priced solid ammonium salts, synthetic organics, and ammonia and its solutions.

Superphosphate production, as well as capacity, has undergone less change in volume, methods, location, or type

than either nitrogen or potash during the past quarter century. Excess capacity exists mainly in the Southeast, while the Midwest and West Coast are deficit areas. Recent construction of processing facilities in deficit areas indicates, however, that as the post-war adjustment progresses, we shall find new capacity locating soundly to serve new demand of permanence. We will also experience some growth of high-analysis phosphate production, with its inherently greater shipping radius tending to locate new facilities near sources of raw materials and low cost power, and with less dependence on nearby consumption than is essential for the ordinary analysis material. Table 7 summarizes the volume of superphosphates we could produce and have produced. In spite of the reverses which the war brought to both types of material with their emphasis on the high-analysis plants, there is a steady although unspectacular growth of the proportion of phosphates both potentially and actually in the high-analysis form.

Trends in Distribution by Government

Phosphates have predominated in government distribution. The Tennessee Valley Authority began distribution in 1935 with approximately 2,000 tons and reached a volume of 42,000 tons in 1944.

The Agricultural Adjustment Agency began distribution in 1937 with 25,000 tons reaching a volume of about 1,200,000 tons in 1942 and receding to 860,000 tons in 1943. In 1943, the AAA-distributed fertilizer is reported to contain 374,000 tons of phosphoric acid and 41,000 tons of K_2O. In 1944, that agency also initiated distribution of a few hundred tons of nitrogen in the State of Maine. And now "grants-in-aid" are paid in several states for all three major nutrients as well as land-liming materials.

TABLE 7, SECTION 1.—SUPERPHOSPHATE PRODUCING CAPACITY (U. S.)

Year	Ordinary Superphosphate		High Analysis Superphosphate		Total Tons of P205
	Tons P205	% of Total	Tons P205	% of Total	
1920	1,440,000	99½%	7,000	½%	1,447,000
1930	1,600,000	97%	44,000	3%	1,644,000
1940	1,528,000	89%	180,000 [1]	11%	1,708,000
1944	1,667,000	85%	287,000 [1]	15%	1,954,000

[1] Includes Tennessee Valley Authority Capacity.

TABLE 7, SECTION 2.—SUPERPHOSPHATE PRODUCTION—UNITED STATES

Year	Ordinary Superphosphate		High Analysis Superphosphate		Total Tons of P205
	Tons P205	% of Total	Tons P205	% of Total	
1929	710,700	95%	34,900	5%	745,600
1934	477,500	94%	31,300	6%	508,800
1939	632,600	83%	125,500	17%	758,100
1944	1,219,500	91%	124,900 [1]	9%	1,344,400

[1] The production of two large plants was largely diverted to war uses in 1944.

TABLE 8.—PLANT FOOD CONTENT OF FERTILIZERS DISTRIBUTED BY COOPERATIVES 1939 THROUGH 1943.

Year	N	P_2O_5	K_2O	Total
1938–1939.....	3.0	12.0	5.5	20.5
1939–1940.....	3.2	12.6	5.7	21.5
1940–1941.....	3.3	13.1	6.3	22.7
1941–1942.....	2.9	12.8	6.5	22.2
1942–1943.....	2.7	12.1	7.0	21.8

Distribution by Cooperatives

Doctor J. G. Knapp reports in a Farm Credit Administration bulletin published in May 1945 that farmer cooperatives distributed 9 per cent of the national fertilizer tonnage, varying from 5 per cent in the Southeast to 20 per cent in the Northeast (Table 9). The only significant trend shown in that publication in the cooperatives' ratio of major nutrients is upward in potash ending with approximately a 3-12-7 in 1943 as compared to other distribution averaging close to 4-10-6. You will note that in concentration the cooperatives exceed other channels of distribution by a contrast of 22 units to 20.

Trends by Crops

Cotton which in 1929 received 28 per cent of the fertilizer used in the United States had decreased to 15 per cent by 1942 and yielded first place to corn which increased during the same period from 21 to 22 per cent.

TABLE 9.—PLANT-FOOD CONTENT OF COOPERATIVE AND OTHER FERTILIZER COMPARED—1942-1943.

Nutrients	Per Cent	
	Cooperatives	Others
Nitrogen.....	2.7	4.22
Phosphoric Acid....	12.1	9.96
Potash.....	7.0	6.06
Total.....	21.8	20.24

Hay and pasture increased from 6 to 13 per cent of the total from 1938 to 1942, and was only 2 per cent in 1929. The increases in fertilizer use on fruits, vegetables, and small grains are well worth the attention of both agronomists and the industry.

Trends in Secondary and Minor Nutrients

Certainly calcium and magnesium, and occasionally sulphur, become limiting factors in nutrient needs under some conditions, in addition to their roles in affecting the acidity of soils. Increased liming is improving the calcium status of soils. Wider use of dolomite (magnesian limestone) is helping the magnesium needs, together with other more active magnesium carriers in some mixed fertilizers. Most fertilizer mixtures contain enough sulphur to remove that element from the troublesome class.

Boron deficiency on some soils and for certain vegetable crops as well as for some legumes is increasingly recognized as a limiting factor by its in-

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TABLE 10.—FERTILIZER USED ON PRINCIPAL CROPS 1929, 1938 AND 1942 [1]

Crop	Per Cent of Total Consumption		
	1929	1938	1942
Corn.....	20.7	21.6	22.0
Cotton.....	28.0	19.3	14.6
Small Grains.....	13.8	14.3	14.1
Vegetables.....	5.3	4.3	8.9
Potatoes.....	8.5	7.4	7.1
Hay.....	2.1	4.1	7.1
Pasture.....	[2]	2.1	5.8
Fruits.....	4.3	4.5	6.7
Tobacco.....	6.8	6.7	5.3
Sweet Potatoes...	1.4	1.8	1.5
Other Crops.....	9.1	13.9	6.9
Total.....	100.0	100.0	100.0

[1] From the Fertilizer Review, July-September 1943.

[2] No estimate, very low.

More birds and better hunting are the tests of game-food planting. Bicolor has demonstrated its value before the dog and gun.

For Farms and Game Preserves, Bicolor Lespedeza

By Verne E. Davison

Southeastern Regional Biologist, Department of Agriculture Soil Conservation Service, Spartanburg, South Carolina

BICOLOR lespedeza has earned a place in the management of land in the Southeast. The seeds are taken readily by bobwhites, the bark and leaves are eaten extensively by rabbits, and the flowers are attractive to honeybees. Bicolor is a dependable plant which will live many years without replanting. At least one plot in the South is more than 50 years old. It withstands burning, disking, cutting, or rabbit use in winter; and it will control erosion on the sites we recommend. You will like its attractive appearance, too.

Bicolor is a shrub that grows 5 to 10 feet high. It is a perennial plant which leafs out each spring as do other woody shrubs. Like the other lespedezas it is a legume. Bicolor and other similar shrub lespedezas were introduced from Asia as ornamentals under names such as Oriental lespedeza and flowering desmodium. Several have more showy flowers but grow less seed than bicolor.

The plants of common bicolor are hardy as far north as central New England, but they fail to ripen seed if frost comes before October 15. This happens too often north of Tennessee and central Virginia. Bicolor has been but partially successful in Florida. Strains, however, have been selected to get a plant better adapted to various conditions. The best are being tested throughout the natural range of the bobwhite quail. Thus bicolor may become more successful north of the Ohio River, and in Florida.

The wildlife border is a symbol of better land use. Above, the abandoned border—useless—troublesome—wasted.

By observation and food studies we now know that bicolor is a preferred food of quail. They eat the seeds in preference to their usual favorites—annual lespedezas, cowpeas, partridge peas, and acorns. The bobwhites begin feeding on bicolor in early fall, before the hunting season. They feed every evening and often at other times of day. One will find the birds using this good food until they change to insects and fresh fruits of early summer.

In feeding tests of pen-reared pheasants in Pennsylvania, bicolor proved to be an excellent food. Doves eat the seed in February and March, although

This picture shows the same border as above, correctly treated, with bicolor against the woods and sericea next to the field.

they seem to prefer other foods when they can get them. Few if any other birds eat bicolor seed. This is fortunate for game conservation, as it leaves the seed for the bobwhites.

Bicolor must be put where it won't be grazed. Heavy concentrations of deer destroy it. Cattle, too, will graze the plant to death.

The Soil Conservation Service began to use shrub lespedezas for wildlife and erosion control in 1935. Besides bicolor, we used *Lespedeza cyrtobotrya* and *Lespedeza thumbergii,* but bicolor was most successful. We used it first in gullies, then on borders between woods and cropland. Food strips in woodland and hedges across fields came later.

Sources of Plants and Seeds

Both plants and seed are already available in limited amounts from three principal sources.

The nurseries of the Soil Conservation Service grow and supply plants and seeds for farmers in cooperation with soil conservation districts. Common bicolor makes up most of this supply, but better strains are available for field tests in certain districts.

Some state game departments purchase or grow common bicolor seed which they distribute to farmers in soil conservation districts—or in some cases to 4-H clubs and others. The Fish and Wildlife Service often makes federal-aid funds available to assist these projects.

A few private seed growers and nurserymen are producing seed and plants of common bicolor commercially. This will be the regular source as soon as the Soil Conservation Service and state game departments have plenty of demonstrations where game can be studied carefully. Better strains will be grown commercially as soon as possible.

The following explains how and where bicolor should be used on farms or game preserves.

Patterns and Objectives

Game management requires a dependable supply of the best foods. Enough cover must be nearby. Quail eat many kinds of seeds, so many, in fact, one need not expect to know them all. Fortunately they do not need all the kinds they will eat. An adequate amount of one good food is enough to grow. They will not be denied a variety, for insects, green leaves, and other

Strips of one-eighth-acre in woodland use no more than one per cent of the land.

A bicolor hedge across the open field provides hunting where birds had no food or cover before.

incidental foods will supplement the food strips.

Every acre of land has some kind of plant which can be recognized as quail food. Often, however, it is not in sufficient quantity to be useful. Fifty pounds of seed scattered over 10 acres are useless. An equal amount on one-eighth acre sets a good table for the birds. Bicolor, therefore, can be used in standard patterns of land management without regard for the absence or presence of other foods.

What constitutes enough cover is not definitely known. Briars, plum thickets, and honeysuckle give very good cover. Woodland is good only if it has shrubs and grass in clumps or open areas. Broomsedge and other grasses may be sufficient with bicolor and nothing else. Thus bicolor may be grown in woods, on borders, across broomsedge fields, or near vegetated stream banks without adding extra cover. We are not yet sure what cover, if any, must be added with bicolor hedges across cultivated fields.

The pattern of planting is very important. The best economy is to use land that is not needed for other purposes. Or if it is necessary to use good land for game, grow a lot of food on a little land. This may take 1% of woodland, 2% of the farm as borders, and 3% of cultivated land in hedges. The remaining 99, 98, and 97% of the land should be used for woodland, pasture, and field crops.

When we try to guarantee enough food for our birds by managing only 1% to 3% of our land, we must manage those small bits of land well. As much food as possible should be produced, on the wildlife land. Good care is worthwhile. Prepare the land well, plant carefully, fertilize to promote excellent growth, and cultivate when necessary to keep the bicolor free of weeds, grass, and trees. This will not be every year—only when other plants begin to invade.

A vigorous growth of bicolor, once started, usually will shade out all other vegetation between the rows. The seed falls only among its own leaves where the birds find it quickly by scratching. Seed that falls in heavy grass is largely lost.

Bicolor can be established with one-year nursery grown plants or by planting seed. Plants are more expensive than seed. Yet plants cost less than

ordinary food patches of cowpeas, millets, and other annuals. The same strip does not have to be planted again next year. Nor is there the risk next spring of the weather being either too wet or too dry at planting time. So regardless of the way the strips are established, bicolor is economical and dependable as a food for bobwhites, rabbits, and bees.

Each food strip will require about 1,000 plants or one pound of seed. When begun with seed, the strip should not be expected to mature seed the first year. Plants, however, produce a good seed crop the first year. If the seed is planted in rows, cultivated, and fertilized well, there should be a good crop of seed the second year. If the seed is broadcast, cultivation is impossible, and such plantings often take three years to mature.

Research stations have not studied the fertilizer requirements of bicolor. Until studies have been made, we can only recommend what appears to be best. Phosphate and potash are needed, as with other legumes. Many farmers use whatever complete fertilizer they have on hand. Potash appears particularly helpful. We notice wherever brush was burned before planting, bicolor always has done well. This new quail-food plant will not need fertilizer every year—only when growth lacks vigor. Therefore, a good fertilizer applied at a rate of 400 to 800 pounds per acre can be afforded.

Bicolor will not grow well on wet land. A soil conservationist can be of help. He knows soils. He knows how and where to use bicolor. If bobwhite food must be grown on wet land, sesbania is used. Bicolor, however, will pull swamp coveys to upland food strips. In deep sands, plants are more successful than seed.

The width of a good bicolor strip is important. Less than 12 or 15 feet in width is too narrow. More than 20 feet is too wide, as wider plantings make bird-dog work disappointing. A width of 15 to 18 feet is best, hunting is pleasant, dogs work beautifully, and birds have enough food.

Food Strips in Woodland

Food strips in woodland will attract the coveys as soon as the seed is produced. We are not sure yet how many strips to grow on 100 acres of land. One for each 20 or 25 acres is conservative. Perhaps one for each 10-acre tract is none too many. We need not think of more than this until further results are measured in terms of quail per strip.

We do not know, yet, how short or long a strip should be in woodland. A length of 400 feet is good. Perhaps 300 is enough. We have found two and three coveys on longer strips, but there the dogs often range too far ahead of the hunter. Furthermore, long strips either take up too much land or leave too much space between strips. So 15-foot plantings 400 feet long appear, now, to be a safe design. This will be about one-eighth acre and should produce 25 to 50 pounds of seed per strip.

To plant this standard strip 1,000 plants or one pound of seed should be used. Plant or seed in five rows, three feet apart. Space plants two feet apart in the row. This takes 200 plants per row. Seeding will be at the rate of 40 or 50 seeds per foot of row. Cover seed one-half inch. Plant when ground moisture is good, any time after spring frost. Or the seed may be broadcast. If the seed is broadcast, it should be rolled into a firm seedbed. A cultipacker is best.

The outside rows (in 5-row plantings) will be 12 feet apart. Prepare the bed six feet wider and cultivate outside as well as between the rows. Seed may be placed in rows 24 inches apart, if preferred; this will require seven rows instead of five. If rows are more than three feet apart, sunlight will make grass and weeds grow too much.

This same design should be used in old fields of broomsedge or brush. If the woods or broomsedge is burned,

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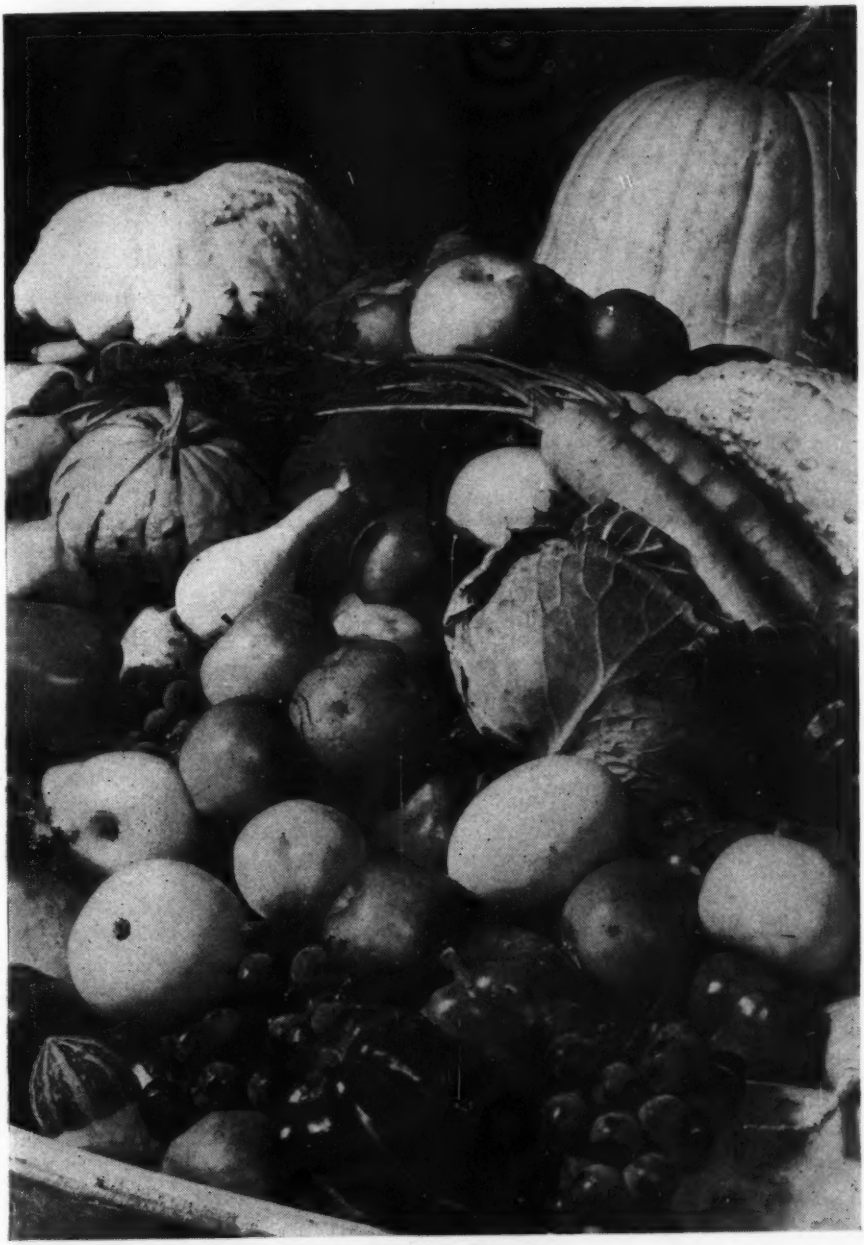
PICTORIAL



An early autumn "still life."

Summer

Landscapes

Above: This ditch or channel drains approximately 800 acres of pasture and crop land near Canton, Mississippi.

Below: Baling kudzu hay, principal winter feed for dairy cows, on the farm of A. D. Wright, Gainesville, Georgia.

The Editors Talk

Agricultural Conservation 1947

Early announcement of the agricultural Conservation Program for 1947 by the U. S. Department of Agriculture is in line with the efforts being made to put the industry on a peacetime basis as quickly as possible. A greater emphasis on the local approach should help farmers make some needed shifts from practices which were necessary for quick wartime production to those of greater long-term, soil-building value.

For the first time, the program for 1947 allows up to 10 per cent of county conservation funds to carry out a practice not included in the list approved for states. The balance of county funds, as before, will be used to carry out practices selected by farmers and committeemen from a long and flexible list. Such lists are worked out in each state by state farmer-committees and technical experts.

Director Dave Davidson of the Field Service Branch, Production and Marketing Administration, believes that the success of the program depends upon farmers and their committeemen who together work out plans for individual farms. He points out that all County Agricultural Conservation Program (AAA) committeemen are active farmers, elected by farmers in local balloting.

"We had to greatly increase the acreage of some soil-depleting crops during the war," Mr. Davidson states. "We cannot continue to grow them on such a scale indefinitely without permanently damaging our land. Record production one year, or for a few years, doesn't necessarily mean record production over the long haul. Our goal is continuing high production year after year. Conservation farming is the only way to achieve such a goal."

In general, the 1947 program is divided into these major types of practices: (1) Application of lime, fertilizers and other materials; (2) planting of cover crops; (3) harvesting of certain legumes and grass seeds; (4) erosion control and water conservation; (5) range and pasture improvement; (6) forestry; and (7) other practices such as weed control and clearance of land for plowing or pasture.

Special emphasis in 1947 will be placed on measures to prevent soil erosion and to conserve water. Such measures include planting of row crops on the contour, building of terraces, erosion control dams, livestock water ponds and similar practices. Use of lime and fertilizers on legumes and grasses will continue to be a major part of the program.

Director Davidson declares that application of these soil-enriching minerals reveals in a dramatic way the immeasurable value of conservation to both city people and those on farms. "Lime and fertilizers improve the health and vigor of legumes and grasses, greatly increasing production and quality," he says. "This means more and better livestock and gives us what we are finally seeking—more and better food to improve the health of our people and those of other lands who need our food and fiber."

New Problems for the Crop Breeder

With the growing of so-called pure line seeds in widely scattered geographical sites, it is becoming apparent that they are not as pure as at first indicated. For example, corn pure lines developed in the Midwest frequently react quite differently when grown in other sections where climatic and soil fertility conditions are different. There is every reason to believe that similar results would occur with the pure lines of other crops.

This opens up new problems for the crop breeder since inbred lines in a territory apparently will have to be developed for the area if the maximum benefits of hybridization are to be achieved.

The susceptibility of plants to disease, the feeding power of plants, their metabolic efficiency, and their ability to produce high-quality forage or feed are all factors which apparently can be materially influenced by the geneticist. Modern crop breeding thus requires the services of the geneticist, the pathologist, entomologist, plant physiologist, soil scientist, chemist, nutrition expert, and almost every other scientist working on the problems of agriculture and even human nutrition. Since obviously no one scientist can be an expert in all these fields, the problem only can be handled by specialists cooperating in well-rounded and interrelated projects.

New possibilities in the production of food, fiber, and forage not only from the viewpoint of quantity but of quality are opened by this work. More efficient utilization of our soil resources and of fertilizers is made possible. This will coordinate well with the greatly increasing interest in growing more nutrition into foods. It will lead to better living and higher standards of living for all the peoples of the world.

The Fairs Are Back

One of the heartiest expressions of relief from wartime restrictions is the welcome being given to return of our agricultural state fairs. Not all states hold one, and a few struggled along with "sorry" editions even under wartime conditions, but this fall will see many splendid revivals—"the greatest and best" from all angles.

It is a fine and worthwhile return, for the state fair is an old and almost typically American institution. Fairs antedate the Christian era, but these were chiefly commercial gatherings for the exchange of merchandise. American fairs have served primarily the function of agricultural education. They have been the show-cases of and inspiration for greater standards of excellence in crop and livestock production as well as all phases of industry and social activity affecting our agriculture. Millions of dollars have been expended on grounds and buildings and millions each year are distributed in prizes to those who have striven and won in the ability to produce more than the "ordinary." According to Dave Thompson of Grocery Manufacturers of America, who has made a survey of state fairs, the Minnesota fair is a good example of the large investment necessary to make these annual shows of the people a success. The operating society, Minnesota State Agricultural Society, has real estate valued at $4,889,845 and total assets, including accounts receivable, of more than $5,600,000.

The age of some of our state fairs attest their importance to both our agricultural and urban societies. Among those which this year will be more than 90 years old are Michigan, Ohio, Illinois, Iowa, California, North Carolina, and Minnesota. Let us hope they can continue uninterrupted for another ninety.

Season Average Prices Received by Farmers for Specified Commodities *

Crop Year	Cotton Cents per lb.	Tobacco Cents per lb.	Potatoes Cents per bu.	Sweet Potatoes Cents per bu.	Corn Cents per bu.	Wheat Cents per bu.	Hay Dollars per ton	Cottonseed Dollars per ton	Truck Crops
	Aug.-July	.....	July-June	July-June	Oct.-Sept.	July-June	July-June	July-June	....
Av. Aug. 1909–July 1914....	12.4	10.0	69.7	87.8	64.2	88.4	11.87	22.55	....
1920.....	15.9	17.3	125.3	141.7	61.8	182.6	16.46	25.65	....
1921.....	17.0	19.5	113.3	113.1	52.3	103.0	11.63	29.14	....
1922.....	22.9	22.8	65.9	100.4	74.5	96.6	11.64	30.42	....
1923.....	28.7	19.0	92.5	120.6	82.5	92.6	13.08	41.23	....
1924.....	22.9	19.0	68.6	149.6	106.3	124.7	12.66	33.25	....
1925.....	19.6	16.8	170.5	165.1	69.9	143.7	12.77	31.59	....
1926.....	12.5	17.9	131.4	117.4	74.5	121.7	13.24	22.04	....
1927.....	20.2	20.7	101.9	109.0	85.0	119.0	10.29	34.83	....
1928.....	18.0	20.0	53.2	118.0	84.0	99.8	11.22	34.17	....
1929.....	16.8	18.3	131.6	117.1	79.9	103.6	10.90	30.92	....
1930.....	9.5	12.8	91.2	108.1	59.8	67.1	11.06	22.04	....
1931.....	5.7	8.2	46.0	72.6	32.0	39.0	8.69	8.97	....
1932.....	6.5	10.5	38.0	54.2	31.9	38.2	6.20	10.33	....
1933.....	10.2	13.0	82.4	69.4	52.2	74.4	8.09	12.88	....
1934.....	12.4	21.3	44.6	79.8	81.5	84.8	13.20	33.00	....
1935.....	11.1	18.4	59.3	70.3	65.5	83.2	7.52	30.54	....
1936.....	12.4	23.6	114.2	92.9	104.4	102.5	11.20	33.36	....
1937.....	8.4	20.4	52.9	82.0	51.8	96.2	8.74	19.51	....
1938.....	8.6	19.6	55.7	73.0	48.6	56.2	6.78	21.79	....
1939.....	9.1	15.4	69.7	74.9	56.8	69.1	7.94	21.17	....
1940.....	9.9	16.0	54.1	85.5	61.8	68.2	7.58	21.73	....
1941.....	17.0	26.4	80.7	94.0	75.1	94.5	9.67	47.65	....
1942.....	19.0	36.9	117.0	119.0	91.7	109.8	10.80	45.61	....
1943.....	19.9	40.5	131.0	204.0	112.0	136.0	14.80	52.10	....
1944.....	20.7	40.8	149.0	192.0	109.0	141.0	16.40	52.70	....
1945									
August.....	21.33	44.9	167.0	256.0	113.0	145.0	14.60	52.50	....
September...	21.72	43.2	138.0	207.0	112.0	145.0	14.30	51.40	....
October.....	22.30	45.9	126.0	180.0	113.0	151.0	14.30	51.00	....
November....	22.52	46.7	131.0	186.0	111.0	153.0	14.90	51.30	....
December....	22.84	43.8	137.0	194.0	109.0	154.0	15.40	51.40	....
1946									
January.....	22.36	36.3	145.0	208.0	110.0	154.0	15.70	50.90	....
February.....	23.01	33.9	146.0	223.0	111.0	155.0	15.80	50.30	....
March.....	22.70	31.9	157.0	236.0	114.0	158.0	16.30	47.50	....
April.....	23.59	42.9	162.0	245.0	116.0	158.0	15.00	48.00	....
May.....	24.09	43.0	157.0	251.0	135.0	170.0	14.80	49.60	....
June.....	25.98	59.0	147.0	251.0	142.0	174.0	14.70	51.50	....
July.....	30.83	56.7	148.0	275.0	196.0	187.0	15.00	60.00	....
Index Numbers (Aug. 1909—July 1914=100)									
1920.....	128	173	180	161	96	207	139	114	....
1921.....	137	195	163	129	81	117	98	129	....
1922.....	185	228	95	114	116	109	98	135	....
1923.....	231	190	133	137	129	105	110	183	....
1924.....	185	190	98	170	166	141	107	147	143
1925.....	158	168	245	188	109	163	108	140	143
1926.....	101	179	189	134	116	138	112	98	139
1927.....	163	207	146	124	132	135	87	154	127
1928.....	145	200	76	134	131	113	95	152	154
1929.....	135	183	189	133	124	117	92	137	137
1930.....	77	128	131	123	93	76	93	98	129
1931.....	46	82	66	83	50	44	73	40	115
1932.....	52	105	55	62	50	43	52	46	102
1933.....	82	130	118	79	81	84	68	57	91
1934.....	100	213	64	91	127	96	111	146	95
1935.....	90	184	85	80	102	94	63	135	119
1936.....	100	236	164	106	163	116	94	148	104
1937.....	68	204	76	93	81	109	74	87	110
1938.....	69	196	80	83	76	64	57	97	88
1939.....	73	154	100	85	88	78	67	94	91
1940.....	80	160	78	97	96	77	64	96	111
1941.....	137	264	116	107	117	107	81	211	129
1942.....	153	369	168	136	143	124	91	202	163
1943.....	160	405	188	232	174	154	125	231	245
1944.....	167	408	214	219	170	160	138	234	212
1945									
August.....	172	449	240	292	176	164	123	233	240
September...	175	432	198	236	174	164	120	228	159
October.....	180	459	181	205	176	171	120	226	181
November....	182	467	188	212	173	173	126	227	235
December....	184	438	197	221	170	174	130	228	223
1946									
January.....	180	363	208	237	171	174	132	226	249
February.....	186	339	209	254	173	175	133	223	275
March.....	183	319	225	269	178	179	137	211	283
April.....	190	429	232	279	181	179	126	213	282
May.....	194	430	225	286	210	192	125	220	177
June.....	210	590	211	286	221	197	124	228	185
July.....	249	567	212	313	305	212	126	266	163

Wholesale Prices of Ammoniates

	Nitrate of soda per unit N bulk	Sulphate of ammonia bulk per unit N	Cottonseed meal S. E. Mills per unit N	Fish scrap, dried 11–12% ammonia, 15% bone phosphate, f.o.b. factory, bulk per unit N	Tankage 11% ammonia, 15% bone phosphate, f.o.b. Chicago, bulk, per unit N	High grade ground blood, 16–17% ammonia Chicago, bulk, per unit N
1910–14	$2.68	$2.85	$3.50	$3.53	$3.37	$3.52
1922	3.04	2.58	6.07	4.66	4.75	4.99
1923	3.02	2.90	6.19	4.83	4.59	5.16
1924	2.99	2.44	5.87	5.02	3.60	4.25
1925	3.11	2.47	5.41	5.34	3.97	4.75
1926	3.06	2.41	4.40	4.95	4.36	4.90
1927	3.01	2.26	5.07	5.87	4.32	5.70
1928	2.67	2.30	7.06	6.63	4.92	6.00
1929	2.57	2.04	5.64	5.00	4.61	5.72
1930	2.47	1.81	4.78	4.96	3.79	4.58
1931	2.34	1.46	3.10	3.95	2.11	2.46
1932	1.87	1.04	2.18	2.18	1.21	1.36
1933	1.52	1.12	2.95	2.86	2.06	2.46
1934	1.52	1.20	4.46	3.15	2.67	3.27
1935	1.47	1.15	4.59	3.10	3.06	3.65
1936	1.53	1.23	4.17	3.42	3.58	4.25
1937	1.63	1.32	4.91	4.66	4.04	4.80
1938	1.69	1.38	3.69	3.76	3.15	3.53
1939	1.69	1.35	4.02	4.41	3.87	3.90
1940	1.69	1.36	4.64	4.36	3.33	3.39
1941	1.69	1.41	5.50	5.32	3.76	4.43
1942	1.74	1.41	6.11	5.77	5.04	6.76
1943	1.75	1.42	6.30	5.77	4.86	6.62
1944	1.75	1.42	7.68	5.77	4.86	6.71
1945						
August	1.75	1.42	7.81	5.77	4.86	6.71
September	1.75	1.42	7.81	5.77	4.86	6.71
October	1.75	1.42	7.81	5.77	4.86	6.71
November	1.75	1.42	7.81	5.77	4.86	6.71
December	1.75	1.42	7.81	5.77	4.86	6.71
1946						
January	1.75	1.42	7.81	5.77	4.86	6.71
February	1.75	1.42	7.81	5.77	4.86	6.71
March	1.75	1.42	7.81	5.77	4.86	6.71
April	1.75	1.42	7.81	5.77	4.86	6.71
May	1.75	1.42	9.08	6.10	4.86	7.30
June	1.88	1.42	10.34	6.42	4.86	7.90
July	1.88	1.42	11.62	8.15	5.34	9.60
Index Numbers (1910-14=100)						
1922	113	90	173	132	140	142
1923	112	102	177	137	136	147
1924	111	86	168	142	107	121
1925	115	87	155	151	117	135
1926	113	84	126	140	129	139
1927	112	79	145	166	128	162
1928	100	81	202	188	146	170
1929	96	72	161	142	137	162
1930	92	64	137	141	12	130
1931	88	51	89	112	63	70
1932	71	36	62	62	36	39
1933	59	39	84	81	97	71
1934	59	42	127	89	79	93
1935	57	40	131	88	91	104
1936	59	43	119	97	106	131
1937	61	46	140	132	120	122
1938	63	48	105	106	93	100
1939	63	47	115	125	115	111
1940	63	48	133	124	99	96
1941	63	49	157	151	112	126
1942	65	49	175	163	150	192
1943	65	50	180	163	144	189
1944	65	50	219	163	144	191
1945						
August	65	50	223	163	144	191
September	65	50	223	163	144	191
October	65	50	223	163	144	191
November	65	50	223	163	144	191
December	65	50	223	163	144	191
1946						
January	65	50	223	163	144	191
February	65	50	223	163	144	191
March	65	50	223	163	144	191
April	65	50	223	163	144	191
May	65	50	259	173	144	207
June	70	50	295	182	144	224
July	70	50	332	231	158	273

Wholesale Prices of Phosphates and Potash **

	Superphosphate Baltimore, per unit	Florida land pebble 68% f.o.b. mines, bulk, per ton	Tennessee phosphate rock, 75% f.o.b. mines, bulk, per ton	Muriate of potash bulk, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash in bags, per unit, c.i.f. Atlantic and Gulf ports	Sulphate of potash magnesia, per ton, c.i.f. Atlantic and Gulf ports	Manure salts bulk, per unit, c.i.f. Atlantic and Gulf ports[1]
1910–14	$0.536	$3.61	$4.88	$0.714	$0.953	$24.18	$0.657
1922	.566	3.12	6.90	.632	.904	23.87	....
1923	.550	3.08	7.50	.588	.836	23.32	....
1924	.502	2.31	6.60	.582	.860	23.72	....
1925	.600	2.44	6.16	.584	.860	23.72	....
1926	.598	3.20	5.57	.596	.854	23.58	.537
1927	.525	3.09	5.50	.646	.924	25.55	.586
1928	.580	3.12	5.50	.669	.957	26.46	.607
1929	.609	3.18	5.50	.672	.962	26.59	.610
1930	.542	3.18	5.50	.681	.973	26.92	.618
1931	.485	3.18	5.50	.681	.973	26.92	.618
1932	.458	3.18	5.50	.681	.963	26.90	.618
1933	.434	3.11	5.50	.662	.864	25.10	.601
1934	.487	3.14	5.67	.486	.751	22.49	.483
1935	.492	3.30	5.69	.415	.684	21.44	.444
1936	.476	1.85	5.50	.464	.708	22.94	.505
1937	.510	1.85	5.50	.508	.757	24.70	.556
1938	.492	1.85	5.50	.523	.774	15.17	.572
1939	.478	1.90	5.50	.521	.751	24.52	.570
1940	.516	1.90	5.50	.517	.730	24.75	.573
1941	.547	1.94	5.64	.522	.780	25.55	.570
1942	.600	2.13	6.29	.522	.810	25.74	.205
1943	.631	2.00	5.93	.522	.786	25.35	.195
1944	.645	2.10	6.10	.522	.777	25.35	.195
1945							
August	.650	2.20	6.20	.503	.749	24.44	.188
September	.650	2.20	6.20	.503	.749	24.44	.188
October	.650	2.20	6.28	.535	.797	26.00	.200
November	.650	2.20	6.40	.535	.797	26.00	.200
December	.650	2.20	6.40	.535	.797	26.00	.200
1946							
January	.650	2.20	6.40	.535	.797	26.00	.200
February	.650	2.20	6.40	.535	.797	26.00	.200
March	.650	2.20	6.40	.535	.797	26.00	.200
April	.650	2.20	6.40	.535	.797	26.00	.200
May	.650	2.20	6.40	.535	.797	26.00	.200
June	.650	2.30	6.45	.471	.729	22.88	.176
July	.650	2.60	6.60	.471	.729	22.88	.176
	Index Numbers (1910-14=100)						
1922	106	87	141	89	95	99	....
1923	103	85	154	82	88	96	....
1924	94	64	135	82	90	98	....
1925	110	68	126	82	90	98	....
1926	112	88	114	83	90	98	82
1927	100	86	113	90	97	106	89
1928	108	86	113	94	100	109	92
1929	114	88	113	94	101	110	93
1930	101	88	113	95	102	111	94
1931	90	88	113	95	102	111	94
1932	85	88	113	95	101	111	94
1933	81	86	113	93	91	104	91
1934	91	87	110	68	79	93	74
1935	92	91	117	58	72	89	68
1936	89	51	113	65	74	95	77
1937	95	51	113	71	79	102	85
1938	92	51	113	73	81	104	87
1939	89	53	113	73	79	101	87
1940	96	53	113	72	77	102	87
1941	102	54	110	73	82	106	87
1942	112	59	129	73	85	106	84
1943	117	55	121	73	82	105	83
1944	120	58	125	73	82	105	83
1945							
August	121	61	127	70	79	101	82
September	121	61	127	70	79	101	82
October	121	61	129	75	84	108	83
November	121	61	131	75	84	108	83
December	121	61	131	75	84	108	83
1946							
January	121	61	131	75	84	108	83
February	121	61	131	75	84	108	83
March	121	61	131	75	84	108	83
April	121	61	131	75	84	108	83
May	121	61	131	75	84	108	83
June	121	64	132	66	76	95	80
July	121	72	135	66	76	95	80

Combined Index Numbers of Prices of Fertilizer Materials, Farm Products and All Commodities

	Farm prices*	Prices paid by farmers for commodities bought*	Wholesale prices of all commodities†	Fertilizer material‡	Chemical ammoniates	Organic ammoniates	Superphosphate	Potash**
1922	132	149	141	116	101	145	106	85
1923	143	152	147	114	107	144	103	79
1924	143	152	143	103	97	125	94	79
1925	156	156	151	112	100	131	109	80
1926	146	155	146	119	94	135	112	86
1927	142	153	139	116	89	150	100	94
1928	151	155	141	121	87	177	108	97
1929	149	154	139	114	79	146	114	97
1930	128	146	126	105	72	131	101	99
1931	90	126	107	83	62	83	90	99
1932	68	108	95	71	46	48	85	99
1933	72	108	96	70	45	71	81	95
1934	90	122	109	72	47	90	91	72
1935	109	125	117	70	45	97	92	63
1936	114	124	118	73	47	107	89	69
1937	122	131	126	81	50	129	95	75
1938	97	123	115	78	52	101	92	77
1939	95	121	112	79	51	119	89	77
1940	100	122	115	80	52	114	96	77
1941	124	131	127	86	56	130	102	77
1942	159	152	144	93	57	161	112	77
1943	192	167	150	94	57	160	117	77
1944	195	176	151	96	57	174	120	76
1945								
August	204	180	154	96	57	175	121	74
September	197	181	153	96	57	175	121	74
October	199	182	154	97	57	175	121	78
November	205	182	156	97	57	175	121	78
December	207	183	156	97	57	175	121	78
1946								
January	206	184	156	97	57	175	121	78
February	207	185	156	97	57	175	121	78
March	209	187	158	97	57	175	121	78
April	212	188	160	97	57	175	121	78
May	211	192	162	99	57	189	121	76
June	218	196	163	100	60	203	121	70
July	244	209	176	103	60	230	121	70

* U. S. D. A. figures. Beginning January 1946 farm prices and index numbers of specific farm products revised from a calendar year to a crop-year basis. Truck crops index adjusted to the 1924 level of the all-commodity index.

† Department of Labor index converted to 1910-14 base.

‡ The Index numbers of prices of fertilizer materials are based on original study made by the Department of Agricultural Economics and Farm Management, Cornell University, Ithaca, New York. These indexes are complete since 1897. The series was revised and reweighted as of March 1940 and November 1942.

[1] **Since June 1941, manure salts are quoted F.O.B. mines exclusively.**

** **The weighted average of prices actually paid for potash are lower than the annual average because since 1926 over 90% of the potash used in agriculture has been contracted for during the discount period. Since 1937, the maximum discount has been 12%. Applied to muriate of potash, a price slightly above $.471 per unit K_2O thus more nearly approximates the annual average than do prices based on arithmetical averages of monthly quotations.**

REVIEWS

This section contains a short review of some of the most practical and important bulletins, and lists all recent publications of the United States Department of Agriculture, the State Experiment Stations, and Canada, relating to Fertilizers, Soils, Crops, and Economics. A file of this department of BETTER CROPS WITH PLANT FOOD would provide a complete index covering all publications from these sources on the particular subjects named.

Fertilizer

"Fertilizer and Fertilizer Material," Ala. Dept. of Agr. & Ind., Montgomery, Ala., Bul. 47, 1944-45.

"Further Studies on the Response of Lettuce to Fertilization," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 199, Oct. 1945, A. E. Griffiths and A. H. Finch.

"Commercial Fertilizers and Agricultural Minerals 1945," Bu. of Chem., Dept. of Agr., Sacramento 14, Calif., Sp. Publ. 214.

"Commercial Fertilizer Sales as Reported to Date for Quarter Ended March 31, 1946," Bu. of Chem., Dept. of Agr., Sacramento 14, Calif., FM-127, May 24, 1946.

"Recommendations for Soil Management and Use of Fertilizers," Ont. Dept. of Agr., Statistics & Publication Branch, Toronto, Ont., 1946.

"Commercial Fertilizers Report for 1945," Agr. Exp. Sta., New Haven, Conn., Bul. 492, Oct. 1945, E. M. Bailey.

State Laboratory—Fertilizer, Seed, Lime, and Ice Cream Report," Vol . 35, No. 4, State Board of Agr., Dover, Del.

"Commercial Fertilizers," Dept. of Agr., Atlanta, Ga., Bul. 130, Jan. 1946.

"Fertilizer Tonnage by Grades Used in Each County in the State During Calendar Year 1945," Ga. Dept. of Agr., Atlanta, Ga.

"Fertilizers Used in Iowa in 1945," Dept. of Agron., Iowa State College, Ames, Iowa, Agron. 47, 1946.

"Fertilizer Trials on Sandy Soils of Chisago and Isanti Counties in 1945," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., S.S. 17, April 1946, J. M. MacGregor.

"Commercial Fertilizers, 16th Annual Report," N. M. Feed & Fert. Control Office, State College, N. M., March 1, 1946, R. W. Ludwick and L. T. Elliott.

"Corn Fertilization Studies in 1945," Agr. Exp. Sta., State College of A. & E., Raleigh, N. C., Agron. Inf. Cir. 142, March 1946, B. A. Krantz.

"Fertilizer Law," Dept. of Agr. & Immigration, Richmond, Va.

Soils

"Gypsum, A Soil Corrective and Soil Builder," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 200, Dec. 1945, W. T. McGeorge.

"Sulphur, A Soil Corrective and Soil Builder," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 201 Dec. 1945, W. T. McGeorge.

"Shall We Fall-plow or Spring-plow in Northeastern Illinois?" Agr. Ext. Serv., Univ. of Ill., Urbana, Ill., Cir. 604, June 1946, R. S. Smith.

"Key and Description of Some Major Upland Soil Types of Iowa," Soils Subsection, Iowa Agr. Exp. Sta., Ames, Iowa, Agron. 49, May 1946.

"Ground Treatments as an Aid in Apple Scab Control," N. Y. State Agr. Exp. Sta., Geneva, N. Y., Bul. 714, March 1946, D. H. Palmiter.

"Oklahoma Crops and Soils, 1946," Agr. Exp. Sta., Stillwater, Okla., Bul. B-295, April 1946, Vernon J. Palmer.

"Economic Land Classification of Fluvanna County," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 371, July 1945, G. W. Patteson and Farrar V. Shelton.

"Economic Land Classification of Greene County," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 372, July 1945, G. W. Patteson and Farrar V. Shelton.

"Soil Survey—The Salt Lake Area Utah," U.S.D.A., Washington, D. C., Series 1936, No. 22, March 1946, D. S. Jennings, J. E. Fletcher, M. H. Wallace, Lemoyne Wilson, I. D. Zobell, F. O. Youngs, and O. F. Bartholomew.

"Soil Survey—Martin County Indiana," U.S.D.A., Washington, D. C., Series 1936, No. 23, March 1946, H. P. Ulrich, T. E. Barnes, Sutton Myers, R. G. Leighty, and A. T. Wiancko.

"Our American Land, The Story of Its Abuse and Its Conservation," U.S.D.A., S.C.S., Washington, D. C., Mis. Publ. 596, 1946, Hugh H. Bennett.

Crops

"Christmas Tree Production," Agr. Exp. Sta., Ala. Polytechnic Inst., Auburn, Ala., Cir. 92, Nov. 1945, J. C. Moore.

"The Climate of Arizona," Agr. Exp. Sta., Univ. of Ariz., Tucson, Ariz., Bul. 197, July 1945, H. V. Smith.

"Walnut Production in California," Agr. Exp. Sta., Univ. of Calif., Berkeley, Calif., Cir. 364, Nov. 1945, L. D. Batchelor, O. L. Braucher, and E. F. Serr.

"Fruit Maturity and Quality," Ont. Dept. of Agr., Statistics & Publications Branch, Toronto, Ont., Can., Bul. 447, March 1946, W. H. Upshall.

"Fifty-eighth Annual Report," Agr. Exp. Sta., Colo. A. & M. College, Fort Collins, Colo., 1944-45.

"Tobacco Substation at Windsor," Agr. Exp. Sta., New Haven, Conn., Bul. 493, Feb. 1946, P. J. Anderson and T. R. Swanback.

"Hairy Indigo, A Legume for Florida," Agr. Exp. Sta., Univ. of Fla., Gainesville, Fla., P. Bul. 624, June 1946, Geo. E. Ritchey.

"1945 Report Florida Agricultural Extension Service," Coop. Ext. Work in Agr., Univ. of Fla., Gainesville, Fla., June, 1945.

"Fruits of Hawaii," Agr. Exp. Sta., Univ. of Hawaii, Honolulu, Hawaii, Bul. 96, Oct. 1945.

"The Lamida, Ebony and Spalding Sweet Cherries," Agr. Exp. Sta., Univ. of Idaho, Moscow, Idaho, Cir. 109, Feb. 1946, Leif Verner.

"Hybrid Popcorn in Indiana," Agr. Exp. Sta., Purdue Univ., Lafayette, Ind., Bul. 510, 1946, Glenn M. Smith and Arthur M. Brunson.

"Alfalfa in Kansas," Agr. Exp. Sta., Kansas State College of Agr., Manhattan, Kansas, Bul. 328, Sept. 1945, C. O. Grandfield and R. I. Throckmorton.

"Louisiana's Program for Peach Production," La. State Univ., Div. of Agr. Ext., Baton Rouge, La., Cir. 259, Jan. 1946.

"Making the Home Lawn," Agr. Ext. Serv., Univ. of Minn., St. Paul, Minn., Bul. 130, April 1946.

"Potato Breeding Methods," Agr. Exp. Sta., Univ. of Minn., St. Paul, Minn., T. Bul. 173, Feb. 1946, F. A. Krantz.

"The 4-H Home Garden," Ext. Serv., Miss. State College, State College, Miss., Bul. 130 (Reprint –30M), June 1945, R. O. Monosmith.

"Fall Gardening," Ext. Serv., Miss. State College, State College, Miss., Cir. 132, Aug. 1945, K. H. Buckley.

"Investigations for the Benefit of the Missouri Farmer," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Bul. 491, Aug. 1945, M. F. Miller, S. B. Shirky, and H. J. L'Hote.

"Cherry and Plum Culture in Missouri," Agr. Exp. Sta., Univ. of Mo., Columbia, Mo., Cir 307, Feb. 1946, T. J. Talbert.

"Author and Subject Index of Department of Agriculture Publications," Dept. of Agr., Trenton, N. J., Cir. 359, April 1946.

"Spinach for Marketing and Processing," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 694, March 1946, C. B. Raymond.

"The Vegetable Garden," Agr. Ext. Serv., Cornell Univ., Ithaca, N. Y., Bul. 696, March 1946, Arthur J. Pratt, R. W. Leiby, Charles Chupp, and R. D. Sweet.

"Color Standards for McIntosh Apple Leaves," Agr. Exp. Sta., Cornell Univ., Ithaca, N. Y., Bul. 824, June 1946, O. C. Compton, W. C. Granville, D. Boynton, and E. S. Phillips.

"Farm Science and Practice," Agr. Exp. Sta., Wooster, Ohio, Bul. 659, June 1945.

"Winter Wheat Varieties for Oklahoma," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Bul. 297, May 1946, A. M. Schlehuber, V. C. Hubbard, W. M. Osborn, C. B. Cross, and R. M. Oswalt.

"Oklahoma Cotton Variety Tests for 1944 and 1945," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Mimeo. Cir. M-157, March 1946, H. E. Dunlavy, I. M. Parrott, F. W. Self, and Merrill Gover.

"The Oklahoma Farm Wheat Improvement Program: Progress Report, 1938-1945," Agr. Exp. Sta., Okla. A. & M. College, Stillwater, Okla., Mis. Publ. MP-9, May 1946, Roy M. Oswalt.

"Christmas Tree Farming in Pennsylvania," Agr. Ext. Serv., Pa. State College, State College, Pa., Cir. 284, Dec. 1945, F. T. Murphey. . .Pa. Sta. Journal Series Papers 1317, "Turnip Variety & Strain Trials—1945"; 1314, "Celery Variety & Strain Trials—1945"; 1311, "Carrot Variety & Strain Trials—1945"; 1310, "Cabbage Variety & Strain Trials—1945"; 1304, "Lima Bean Variety & Strain Trials—1945"; 1309, "Pepper Variety & Strain Trials—1945"; 1305, "Sweet Corn Variety & Strain Trials—1945"; Agr. Exp. Sta., Pa. State College, State College, Pa., M. L. Odland.

"Agricultural Research in Texas," Agr. Exp. Sta., A. & M. College of Texas, State College, Texas, June 1, 1946.

"Suggestions for Growing Cantaloupes in the Texas Winter Garden," Agr. Exp. Sta., A. & M. College of Texas, College Station, Texas, P.R. 988, Feb. 11, 1946, E. Mortensen.

"Vahart Wheat, a New Variety for Virginia," Agr. Exp. Sta., Va. Polytechnic Inst., Blacksburg, Va., Bul. 386, Jan. 1946, T. M. Starling, S. A. Wingard, and M. H. McVickar.

"Judging Mountain Meadow Range Condition in Eastern Oregon and Eastern Washington," U.S.D.A., Washington, D. C., Cir. 748, April 1946, Elbert H. Reid and G. D. Pickford.

Economics

"Suggested Agricultural Production for Delaware 1946," Agr. Exp. Sta., Univ. of Del., Newark, Del., Pamph. 20, July 1945, R. O. Bausman.

"Cash Farm Income by Counties and by Commodities, Delaware 1941, 1942, 1943, and 1944," Agr. Exp. Sta., Univ. of Del., Newark, Del., Pamph. 22, Dec. 1945, R. O. Bausman.

"Indiana Crops and Livestock, Annual Crop Summary 1945," Dept. of Agr. Statistics, West Lafayette, Ind., Dec. 1945.

"Pre-Harvest Sampling of Soybeans for Yield and Quality," Agr. Exp. Sta., Iowa State College, Ames, Iowa, Res. Bul. 41, Jan. 1946.

"Nebraska Looks Ahead," Agr. Exp. Sta., Univ. of Nebraska College of Agr., Lincoln, Neb., Bul. 380, Dec. 1945.

"The Cultivated Blueberry Industry in New Jersey, 1944," Dept. of Agr., Trenton, N. J., Cir. 356, June 1945, D. T. Pitt.

"Facts and Figures, Annual Potato Summary, Crop of 1945," Dept. of Agr., Trenton, N. J., Cir. 358, March 1946, Alavah W. Severson.

"A Credit Study on 167 Tobacco Farms Puerto Rico, 1939-40," Agr. Exp. Sta., Univ. of P. R., Rio Piedras, P. R., Bul. 69, March 1946, Julio O. Morales and Sol L. Descartes.

"Some Price Factors Affecting Farm Adjustment in Cotton Counties of Tennessee," Agr. Exp. Sta., Univ. of Tenn., Knoxville, Tenn., R. Res. Sev. Mon. 195, Feb. 15, 1946, B. H. Luebke.

"Hay Harvesting," Agr. Exp. Sta., Univ. of Vt., Burlington, Vt., Bul. 531, June 1946, Robert M. Carter.

"Steps Toward Farm Ownership," Ext. Serv., Univ. of Wis., Madison, Wis., Cir. 368, March 1946, P. E. McNall.

"Commodity Futures Statistics," U.S.D.A., Washington, D. C., CS-17, April 1946.

"Fruits (13 Noncitrus), Production and Utilization 1934-45," U.S.D.A., Washington, D. C., June 1946.

"The Changing Picture in Agricultural Finance," Farm Credit Adm., U.S.D.A., Washington, D. C., Cir. A-24, March 1946, I. W. Duggan.

"The Status of Cooperatives in Fruit and Vegetable Canning 1943 and 1944," Farm Credit Adm., U.S.D.A., Washington, D. C., Mis. Rept. 97, April 1946, G. M. Weber.

Trends in Use of Major Plant Foods

(*From page* 21)

clusion in mixtures for specific purposes. Two schools of thought seem to have developed in its use. One follows the practice of including borax in small amounts in all mixtures. The other uses borax in larger amounts in mixtures for specific purposes only. I prefer the latter practice both because of the toxic properties of borax if used carelessly and because I am as yet not convinced that we are justified in curing our nutrient ills by a gun-shot prescription, although I prefer a preventive to a post-mortem approach.

Recently cobalt has become important as an element in certain ruminant-feeding areas. At present cobaltous sulphate is being used as a drench applied to feed. How we should or may apply that element in fertilizers is yet to be determined. In any case, the developments concerning cobalt and other rare elements open up new areas of fertilizer use in terms of removing elusive first limiting factors which clear the tracks for more economic use of the major plant nutrients.

Organic Matter

None of us intend to ignore the importance of soil tilth in fertilizer use. Organic matter, aeration, moisture balance are all so important that I shall stress them here by brevity of treatment in our search for major nutrient efficiency. Here is a wide field for the soil physicists to develop with our interested approval and cooperation. Crops, like human beings, must breathe and be refreshed with moisture and sunlight if they are to thrive on the other dynamic factors which feed them and manufacture their chlorophyl and other building blocks.

A Look Ahead

No crystal ball is required to discern some of the major nutrient pattern which lies ahead. The historical pattern will project itself into the future, not statically we may be sure, but dynamically. There will be a further narrowing of the ratio of phosphoric acid to nitrogen and potash. Pioneer areas will, as in the past, begin with phosphates and progress toward the 1-1-1 ratio as the agriculture intensifies, and the minds in them grow. Soil, rainfall, types of farming, returns per acre, costs for nutrients, and the secondary as well as minor elements will all have their effect on major nutrient use. But so also will ideas and the proof of ideas in the

TABLE 11.—MAJOR NUTRIENT RATIOS IN MIXTURES, MATERIALS, AND TOTAL FERTILIZER DISTRIBUTED IN THE UNITED STATES—1934 AND 1939

U. S.	Mixtures			Materials			Total			Total Nutrient Volume Trend
	N.	P_2O_5	K_2O	N.	P_2O_5	K_2O	N.	P_2O_5	K_2O	
1934.....	20	51	29	41	46	13	25	50	25	100
1939.....	19	49	32	41	45	14	26	47	27	147

Based Upon National Fertilizer Association Surveys by Mehring and Smalley for 1934, and Mehring, Deming, and Willet for 1939.

field. Potash will increase in ratio steadily; nitrogen will climb in some regions and decline in ratio in others. Good management needed on the farm in utilizing the feed crops produced with heavy nitrogen applications makes the job of sound nitrogen promotion a most challenging one. Superphosphate producers will learn to understand that a decreased phosphate ratio need not mean less volume and that if it does the welfare of users ranks ahead of manufacturers' desires. To their credit, more superphosphate producers than we may believe have such an attitude already and are wisely working to develop uses where potential markets are incompletely tapped.

Various estimates have been made of the quantity of commercial fertilizer that farmers will buy. Other estimates have been made of the amount we should use nationally. Some of these estimates indicate a possible need for doubling our present fertilizer use. That would be four times the amount we averaged to use during the five-year period 1935 to 1939. Such goals serve a constructive purpose in stimulating thought. I like them because they do that. But I am sure we should not take such estimates literally. Certainly we can afford to use greater quantities of fertilizer if they are used effectively. As we increase the use of fertilizer further, the need for better management to accompany such use becomes even more important than with our present volume. Thus, we should proceed gradually and I feel sure we will in building still greater fertilizer use.

I suggest that the greatest opportunities ahead are in those fields of ideas and their promotion which those of us in industry and agronomy may both

TABLE 12.—POTASH CONSUMPTION IN THE CONTINENTAL U. S., CALENDAR YEARS 1925, 1940, AND 1945, SHORT TONS OF K_2O

Class of Material	Per Cent of Total		
	1925	1940	1945
60% Muriate of Potash.....	7.4%	69.2%	78.5%
50% Muriate of Potash.....	34.9%	20.5%	8.8%
Sulphate of Potash.....	14.5%	7.0%	5.2%
Sulphate of Potash-Magnesia.....	.....	0.3%	2.5%
Manure Salts and Kainite.....	43.2%	3.0%	5.0%
Total K_2O Volume Trend.....	100	152	269

Data for this table furnished by the American Potash Institute.

attack with vigor and imagination. (1) The relation of fertilizers to improved strains of crops, (2) the expansion of feed crop fertilization, (3) the fertilization of rotations in better management of soils, (4) the expansion of soil and plant tissue testing in their sound place toward more economic fertilization, (5) cleaning house of the unnecessarily dilute fertilizer grades still cluttering up the corners of the fertilizer industry's back kitchen, (6) learning a lot more about the secondary and minor elements and their use, (7) the development of new and better fertilizer application machinery to handle tomorrow's fertilizers, and (8) learning how to measure and affect favorably that elusive but important factor of soil tilth, are but a few of the "Ideas Unlimited" which lie ahead. As we tackle these and other problems, we can be sure that not only will others present themselves but that we'll have the stimulating experience of learning that the answers are sometimes simple and sometimes complex, but frequently obvious when we know the why as well as the how.

Regulations

Control laws affecting fertilizers were, I believe, instituted to protect fertilizer consumers from fraud. None of us, I am sure, object to such safeguards. Nor have we objected to most of the wartime restrictions of the type included in food production orders.

Custom built up some ridiculously complex lists of fertilizer grades. Most of us approve reasonably practical limitations of grades. I do not believe we need mandatory restriction to maintain some sense in the ratios and grades of major plant foods to be offered for use. I urge that among the trends in major nutrients we do not twist our control laws into mandatory limitations. Industry will welcome the agronomists' recommendations. Most fertilizers offered will in the future follow such recommendations. Agronomy is not yet an exact science. In our effort to establish reasonable order, let's not trip over the rope of standardization and stifle the progressive minorities. There are an increasing number of top executives and agronomists in the fertilizer industry who have the courage and the sense to limit their fertilizer offerings to a group which their factories can manufacture and distribute with economy. The day is gone when small variations in grade or ratio can or will be produced by most of the industry. But regimenting by regulation is hardly an acceptable substitute for constructive education or good business judgment.

I particularly hope that unlike the custom in recent years in some sections any recommendations made by agronomists will include an emphasis on higher analyses of suggested minimum grades. Only one or two groups of states even mentioned such possible multiples during the war. Let's open the gate for such progressive moves as we settle down to the interesting tasks to come.

Meet the King of Queens

(*From page* 14)

advertised in four years. It has been a problem of rationing bees and queens to customers rather than selling them more, or finding new customers. Usually by October he books all the orders he can fill the following season.

Queens are shipped in small cages with six to 12 worker bees with each queen to look after her. Package bees move in two, three, four, and five-pound packages with a queen caged in the center of each package. Each queen brings about $1.25, while each two-pound package of bees plus a queen

A view of Heaven's Hill queen yard which is owned and operated by W. E. Harrell, Hayneville, Alabama.

sells for about $4.00. In each queen cage goes a small piece of sugar candy and in each package of bees a small can of syrup to feed the bees and queens in transit.

You would think that a man spending his entire time caring for this mass of bees would produce and harvest a lot of honey. All he harvests is enough for home use, plus enough to pay a few landowners who prefer honey instead of cash for rent. The bees produce considerable honey each spring and summer, but are permitted to eat it during the winter months. In this way the amount of sugar needed to carry them through the winter season is reduced greatly.

Harrell is credited with having one of the most modern bee workshops in the country. In it he makes practically everything he needs in producing and marketing bees and queens. He uses white pine, principally from the State of Washington, in building frames and high bodies for the hives. Cypress is used in constructing bottom boards and basswood in building queen cages. When he and his helpers are not busy with the bees they work in the workshop.

After 32 years of training and experiences in the bee and queen world, Harrell is fully convinced that there are many excellent opportunities for G. I. students to study bee culture in college and to enter the bee business following graduation. "I wish you would tell them there is room in the bee, queen, and honey business for many more well-trained men," he said.

Harrell is just one of several hundred beekeepers who have developed a yearly $2,000,000 package bee and queen business in the South and Southwest, principally in Alabama, California, Georgia, Florida, Louisiana, Mississippi, South Carolina, and Texas. He estimates that for each dollar received by beekeepers $15 to $20 worth of pollination services is rendered to agriculture. This is in addition to the 200,000,000 pounds of honey and 4,000,000 pounds of beeswax produced by the country's 800,000 beekeepers each year.

Emphasizing the importance of bees to American agriculture, Harrell expresses belief that honeybees officiate

at more successful weddings than all ministers and public officials put together. Officials of the U. S. Department of Agriculture agree and call honeybees "The Priests of the Flowers." They marry pretty flowers to each other instead of beautiful girls and handsome boys and are paid in small bits of nectar instead of money.

Harrell also gives the billions and billions of marriages performed by honeybees credit for much of the happiness of human marriages. "As you know," he says, "it is through flower mating or cross-pollination that we have our delicious apples, berries, peaches, and cantaloupes, and nutritious carrots, cabbage, cauliflower, kale, kohlrabi, onions, turnips, and other vegetables. There is no doubt that honeybees, the only pollinating insects that can be propagated and controlled, work hard for city folks and victory gardeners as well as farmers by pollinating the blossoms of more than 50 crops, including fruits, vegetables, and clovers.

"Our meat supply also is greatly dependent upon the marriage of clovers, alfalfa, and some of the other plants which livestock eat.

"Whether or not we have cotton clothes depends upon whether or not there are honeybees to pollinate or marry cotton flowers to each other."

For Farms and Game Preserves—Bicolor Lespedeza

(*From page* 26)

allow the fire to burn the bicolor, too. It will not hurt.

Borders

Borders, we think, should extend the full length of the woodland-cropland edge. This land has no other use. Hunting at the woodland edge will be rough, compared to open-field and open-woodland shooting.

The border of bicolor should be 15 to 18 feet wide—no more, no less. If croprows run into the border, a 12- to 15-foot strip of sericea lespedeza for turning will be needed. Sericea is a poor bird food but a good ground cover for the birds. Bobwhites will be found resting by day and roosting at night in sericea, particularly if they have no grassy cover in the woods. Quail do not rest or roost in bicolor in winter. They go there only to feed. Its cover is sufficient for safe feeding.

Hedges

Hedges of bicolor in crop fields are new. We are not yet sure that they are worth the land they occupy. Strips 15 feet wide (five rows) will take 3% of the land if grown 450 feet apart. They must go all the way across the field to join cover at one end or both. We believe one hedge will support another as added cover. The crops grown between the hedges should be different where the rotation makes such an arrangement possible. Don't try these hedges until use of all borders has been made and strips put inside the woodland.

Bees

Bees use bicolor extensively during August when other foods are scarce. During this time they increase their broods and store small amounts of honey. Bicolor honey is light-colored and good-flavored. The same patterns of woodland strips, borders, and hedges are helpful to bees.

Summary

The objective is to grow a supply of a good food on a small amount of land, to have more game, particularly quail.

Size of strip: Approximately 20 feet wide, 400 feet long.

Preparation of site: Needs to be good. The soil must be firm for seeding.

Fertilization: 400 pounds phosphate and 100 pounds potash per acre, applied

before planting. Or use 500 pounds 0-14-10 or a complete fertilizer.

Planting design: Five rows three feet apart. Space plants two feet apart in rows. Broadcast seed or place in seven rows two feet apart.

Cultivation: Two or three times the first year. Succeeding years as needed.

Maintenance: Add fertilizer and cultivate when necessary to maintain vigor. Burn or cut back in winter if desirable.

South Mississippi Soils Produce Fine Pastures

(*From page* 12)

of improved pastures, although one of the most difficult to get farmers to practice.

What does it cost to develop an acre of pasture on this land? This is an important question and the economics of all farm practices must be considered. The farmer operating farm A itemized everything that went into the building of his pastures, and at present prices it was estimated to cost approximately $30 per acre, neglecting AAA benefit payments. This is a considerable amount to spend in developing an acre of pasture, but when we consider that two cows were grazed on each acre of one pasture for the greater part of the year of 1945, it becomes a good investment. After the first year, the cost per acre decreases to the amount necessary to purchase 1,000 pounds of slag and 50 pounds of muriate of potash. The farmer said, "It is much better than growing cotton and I have time to fish in the new pond."

The length of time that this pasture will produce excellent grazing has likewise been considered in the over-all plan of the farm. The Soil Conservation Service technician firmly believes that good preparation of the land is a vital factor in the success of improved pastures, and that after six or eight years in pasture the amount and quality of forage will decrease. Many noxious weeds will also invade the pasture land. When this occurs, the pastures are to be plowed up and planted to oats or row crops in order to take advantage of the nitrogen from the clover and the residual effects of the years in pasture. Some other field that has been in row crops will be mineralized and seeded to pasture and the previous pasture land will produce the row crops. This will give an opportunity to free the old pasture land of weeds and undesirable plants. The permanent pasture idea is becoming less important under this farm plan and more emphasis is placed on permanent or year-round grazing.

Another typical example is the case of farmer B who is engaged in the dairy-cotton type of farming. This farmer signed an agreement with the Soil Conservation Service in 1945 and planted 17 acres of alyce clover in the summer on land that had been in oats. The alyce clover was cut for hay in late September, and the field was then fertilized with a mixture slightly different from the pasture treatment mentioned above. The soil was mineralized with 500 pounds of basic slag, 500 pounds of 20% superphosphate, and 200 pounds of muriate of potash. This mixture was disked into the soil and the field was seeded to crimson clover on October 1, 1945. On February 1, 1946, forty-one dairy cows started grazing this clover field and continued until April 15.

It is estimated that the increased production of milk during this 75-day period and the feed saved amounted to approximately $60 per acre. The clover could have been grazed longer, but the herd was removed in order to obtain a seed crop. The field is shown in figure 11 on April 25 and an abundant seed

Fig. 8. Cattle get their nutrient requirements by 10 o'clock in the morning on a pasture that has been well fertilized.

crop had developed. When the seed crop is harvested, more income will be realized in addition to that obtained from the early spring grazing. Farm plans of this farm are shown in maps 3 and 4. Map 3 presents the farms before farm adjustments were made and map 4 shows the same farm with the changes recommended by the planning technician.

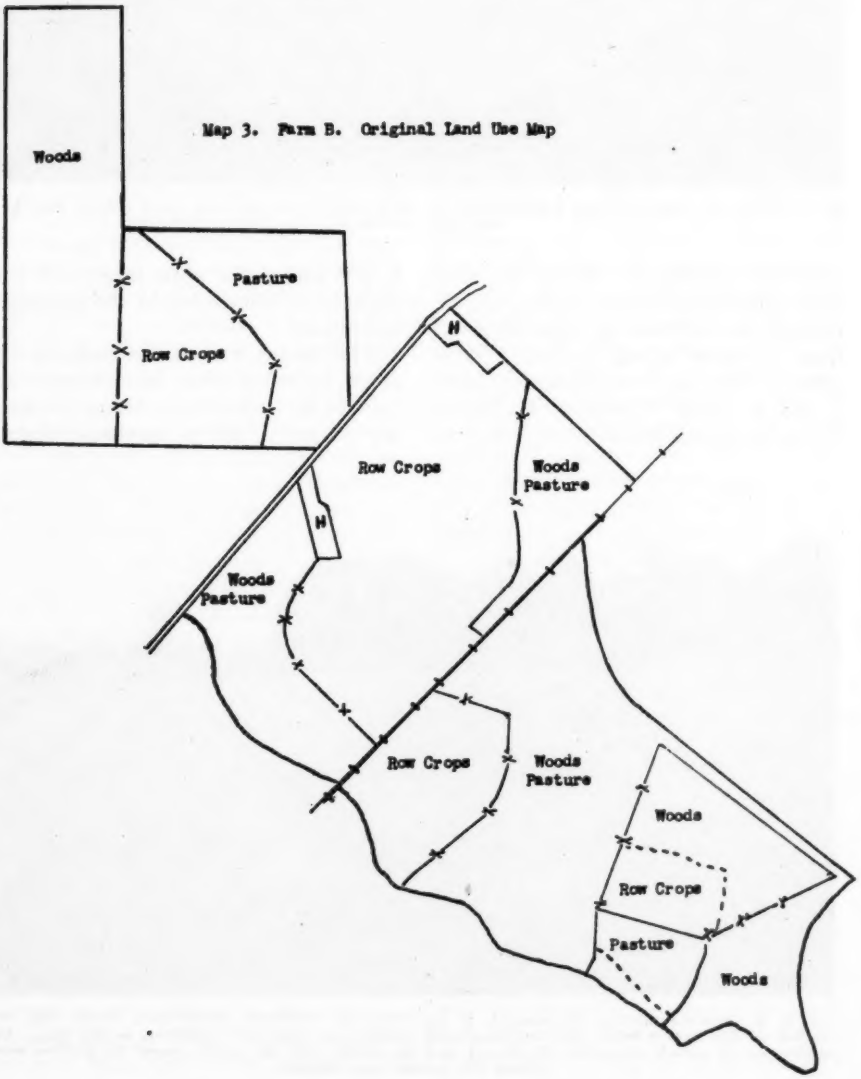
This farmer expects to remain in the dairy business, and, like farmer A, expects to furnish year-round grazing for his cows. He is convinced that it

Fig. 9. A complete mixture of minerals is necessary for maximum production. Basic slag was applied to this entire field. In the foreground potash was applied in addition to the slag. The application of potash stimulated the clover, and the farmer said the cattle grazed the portion more where the potash was applied.

can be done by using minerals on his soils and proper pasture management. Saving feed is generally an expensive operation and using the cow to harvest the crop is much more economical.

Many other farms that have undergone a change from cotton to cows as a result of assistance and recommendations of the agricultural leaders could be mentioned and pictured in Walthall County. One improved pasture that lasted 8 or 10 years and then failed was located. This farmer plowed the pasture land and remineralized it in the fall of 1945 without seed. In the spring of 1946 the rejuvenated, improved pasture was similar to the pasture obtained the first year it was established. This brings to our attention again the importance of minerals in a pasture program.

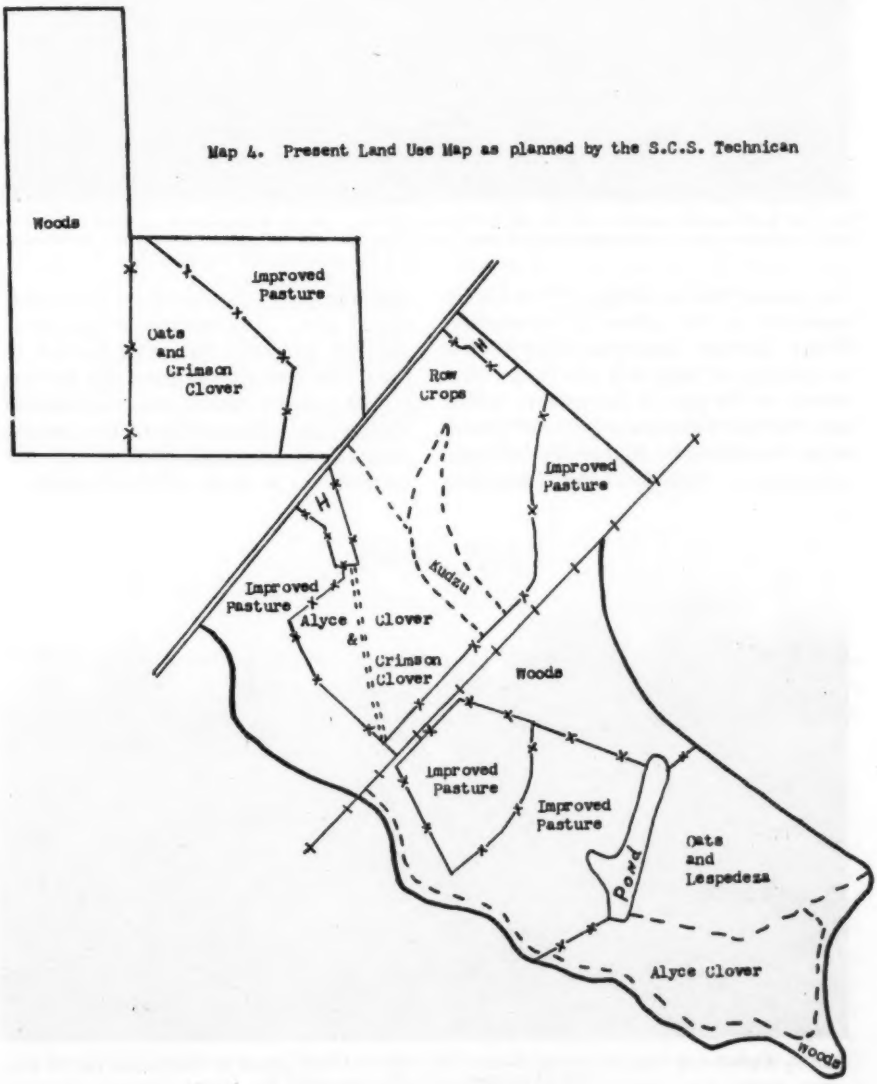
The effect of minerals on the pasture plants is shown in figure 3. A strip across this field was seeded, but received



Map 3. Farm B. Original Land Use Map

no minerals. The boundary line between minerals and the no-minerals strips is distinct as indicated by growth of the plants. This is a first-year pasture and located on poor sandy soil containing a considerable quantity of gravel. Adequate minerals not only increased the tonnage produced per acre but improved the quality of the forage as well. This is clearly shown in figure 4 which is the same scene as figure 3 after two months of heavy grazing. The unfertilized plot has not been grazed by the cattle and the fertilized plot was grazed closely. The animals grazed only as far as the minerals were applied.

In order to ascertain why the cows preferred to graze the fertilized portion of the pasture instead of the unfertilized part, composite samples of the forage were collected from each part of



Map 4. Present Land Use Map as planned by the S.C.S. Technican

Fig. 10. Soil erosion reduces the growth of pasture plants. In the background the land is steeper and accelerated soil erosion had taken a heavy toll from the soil before the pasture was developed.

the pasture shown in figure 3 and were analyzed in the chemical laboratory. These data are shown in table 1. It is interesting to note that the plants produced on the part of the pasture which was treated with basic slag and potash were considerably higher in calcium, phosphorus, nitrogen, and potassium than the plants produced on the unfertilized plot. The analysis of the plants and the fact that the cattle elected of their own free will to graze the portion of the pasture which was mineralized indicate that the quality of the pasture plants was increased along with the quantity as a result of fertilization.

Fig. 11. A good seed crop of crimson clover. This field had been grazed by dairy cattle for 75 days. This photograph was taken on April 21.

A complete mixture of minerals is also essential. Figure 9 shows a demonstration where potash and basic slag were checked against basic slag alone. Not only is there a difference in growth in favor of the potash, but the operator stated that the cattle grazed the part of the field more where the potash was applied. This indicates that the cows were again able to detect quality in forage stimulated by minerals added to the soil. The animal has often surprised man by his ability to detect soil fertility that has been delivered by the soil into plants. The influence of potash on the composition of the pasture samples collected from the demonstration shown in figure 9 is shown in table 2.

The improved pastures just described

TABLE 1.—EFFECT OF MINERALS ON THE COMPOSITION OF PASTURE PLANTS*

Treatment	% Ca	% P	% N	% K
No treatment.....	.42	.22	1.09	1.94
Basic slag and potash.	.80	.38	2.92	2.43

*Analyzed by Mississippi Experiment Station Chemist.

TABLE 2.—INFLUENCE OF POTASH ON THE COMPOSITION OF PASTURE PLANTS*

Treatment	% Ca	% P	% N	% K
Basic slag.....	.42	.22	1.30	1.19
Basic slag and potash.	.82	.39	2.96	2.59

*Analyzed by Mississippi Experiment Station Chemist.

are quite a contrast to many so-called pastures in the South. Figure 2 shows a typical upland pasture where several acres are required to support one cow. This same scene could be changed into a profitable enterprise as well as one of scenic beauty by the use of minerals and good pasture management. Under a mild climate which prevails in this section, beef cattle can be produced without expensive barns and shelter and with little or no purchased feed. This would enable a farmer to stay in the business if the price of beef should decrease considerably from its present level. With the present shortage of farm labor which demands a decrease in cotton acreage, a golden opportunity is still available for many farmers in the hill section of Mississippi.

Fertile Dirt

(*From page* 5)

weaning away by attractive paying jobs in arms, aircraft, and powder plants.

Some severe shortages of materials, lack of skilled scientists and research men, and a badly overloaded transportation system as well as the warehouse limitations, all combined to make aspirin (or something a trifle stronger) a daily reliance of these industrial leaders.

They heard Claude Wickard and his information boys in USDA shout that food must win the war and dictate the peace. The farmers soon re-echoed this cry and booked startling tonnages for feed and forage crops as well as for cotton, oil seed crops, and cereals. It was 1915 all over again, except that back in those mellow times of conflict we were manure-minded and rolled out our own plant food, such as it was.

THE response to the new appeal was so instant despite all these handicaps that the farmer in need of mixed goods or special plant-food items had only to keep his motor truck running to secure at the supply store in his nearest town something his crops would relish. He could get six and a half hundredweight of nitrogen where only three and a half were on tap before; thirteen bags of phosphate instead of a previous seven; and seven and a

half units of potash where only three and a quarter were at his bidding before the war. Sometimes a fertilizer man with biographical talent will fix up a story relating just how the demand was met during that era of urgency and reduced wherewithals.

And yet the well of plenty can stand further priming. After the dust clouds of war begin to settle we can peer through the murk and distinguish how miserable humanity becomes when drunk with destructive debauch. Every speech by Hoover and every riot abroad only renews the pressure for sustenance from the soil—so far mostly our soil. There is no shadow of surplus cast across the rural landscape yet, except for potatoes. The age-old theory of the farm will operate anyhow, to make the land productive and to fill the depleted storages against a time of plagues and locusts, of hail and flood, and other unseen hazards. The reflex action coming to our food providers after those years of "stimulated contraction" is a powerful force that meets the inmost traditions of agriculture. So if you think that the war years brought us terrific fertilizer usage, watch what happens next!

Of course, we of the fertile places untorn by war cannot assume the whole job of keeping folks abroad alive and kicking, especially the latter. In due course there will be a return to domestic normalcy, and our expanded acreage will need to be further adjusted to fit a nation of limited stomach capacity.

Meanwhile, we observe with some dismay reports by our friends who travel into the Southwest that for every twenty-five acres the government withdrew from cultivation in the so-called dust bowl plains, there are over six hundred acres being plowed and planted to fill the present world shortage of victuals. If these operators are well fortified by bank assets and follow better soil-conserving systems than before, perhaps the net result will not be a repetition of old disasters. At any rate, it becomes a duty for the fertilizer leaders to watch those areas and help direct a safer and saner course in their management. At least it is unsound to be a party to exploitation there for the sake of the moment's passing reward.

Moreover, it appears to be the privilege of these leaders of conservation of natural resources to do all they can to ward off a fickle flare-up of speculative land grabbing. One cannot expect a debt-ridden farmer to be a steady and discriminating customer of supply houses, as he may be moving off under sheriff's orders before the spring of 1950. The local fertilizer dealer can help much in checking such tendencies and in a negative way at least he can be of assistance by not encouraging loose talk among his customers about the golden margin to be found at the end of the land boom rainbow. It's better to lose a future dollar than to wager your security on a continued spell of world starvation, anyhow during a time when we insist on getting the world's top prices. Just as soon as the other half over there get the mud out of their hair and patch up their machinery and locate enough land-plaster to coax up some sprouts again, we won't have them on our hands at meal-time.

IT IS better economy and sounder planning to export machinery, fertilizer, and seed to these ravaged countries so they may regain their productivity than it is to drain our soil resources in continued sales or gifts of grains. To defer establishment here of a fertility program to consider more than mere emergency acre-yield boosting is time and money lost.

Does fertility mean only increased crop production? Has it a more balanced and permanent place in agriculture than this temporary one? Do conservation of soil and water resources always fit into a cash-and-crisis food campaign? How much more do we need to know and apply about the science of soil maintenance? May we mine out the cream of our fertility now and neglect the vital portion of the

legacy we leave to others? Is this a period of empirical advantage or a time to take stock and renew our obligations to the pioneers?

One unanswered puzzle is the possible connection between the use of plant food on the land and the nutritional value of foods originating in one or another on such land. Folks are working hard at this experiment now and trying to see a clear picture of the whole thing.

OF COURSE, we already recognize that a cow more abundantly fed on high yields of feed per acre will give more milk and butterfat per acre, but what is not always so evident is whether certain states of the soil as to fertility levels and the various plant-food elements it contains will change the quality and nutritional value of the same amount of milk and butterfat.

Some tests have given us a glimmer of insight into this but we will have scores of them to aid us in a few years. How will it affect wool fiber, the vitamins in beef and pork and the food value of eggs built upon grains, hay, and pasture from land differently fertilized and limed? If and when we know it in a fairly definite way, it will challenge us with another kind of commodity pricing system.

If this nutritional scale ever comes into effect so strongly as to convince consumers of its real merit, there must then be a way established to reward producers who take pains and invest time and money sufficient to produce those kinds of foods on land in a higher state of balanced fertility. You can't expect a dairyman to worry much about the vitamin A in his cow's milk tonnage daily as long as the measure of his payment is still upon gross weight and the fat test only. But if slowly and carefully plans are laid and perfected to discriminate somehow between low-nutrition foods and the land that produced them, we'll be facing another revolution in economics for agriculture. All this may be ballyhoo poppycock nonsense, but that's the way the first horseless carriage and the subsidy program looked prior to universal application of them. Anyhow it's high time for a revolt in economics to match the new era in mechanics and electronics. Better get ready to take brain barnacles off and remove the eye-blinders.

After all, the fertilizer game is linked with the whole farm pattern. A guy may have a modern fertilizer formula and the best equipment to apply it, but be minus enough brains and judgment to follow through and round it out. Plain laziness and indifference make a bad combination with fertilizer.

Good fertilizer will raise mighty luxuriant weed crops. It will raise good sturdy soil-depleting crops where soil-binding and nitrogen-fixing ones are required. It will raise timothy and Bermuda grass of great tonnages where a legume mixture would make more milk and beef. It will raise hell with conservation if the operator is a soil spend-thrift.

A STANDPATTER may invest in super-duper brands of plant victuals and throw a lot of it away by insisting upon using open-pollinated corn instead of hybrids, cheap bargain grass seed instead of tested varieties of known good origin, or bonanza wonderberries which look better in litho ink than on the land.

Moreover, the degree of intelligence displayed by a farmer in grasping the modern principles of cooperation in marketing, soil conservation district participation, rural electric facilities within his reach, and educational demonstrations and conferences ties into the net return he gets on his fertilizer. Like any tool used to promote welfare and prosperity, fertilizer is at its best when coupled with similar means and methods contributing to the same end.

Therefore, this means closer working alliances are needed between chemists and economists, physicists and plant breeders, biologists and engineers. As

it is we usually go off in separate groups and spiel and splutter about the destiny and the dilemmas of agriculture, as seen from isolated and narrow angles. Maybe we have so many splendid specialists that we lack enough coordination. I know at any rate that the calendar is plenty full of separate conventions that specialize in saving farmers. However, I am happy to note that we are really making vast progress by virtue of so many powerful corporations which use their experience and influence in a broad way, not confining themselves to lectures and literature for the sale of more of their own pet product. This is a good sign that we are entering a better period of commercially financed education.

And we must have both private and public avenues of education. Rightly run, they supplement each other. As a team they can do much good. Your private education program can offer inducements and prizes and such that no public-supported agency is able to undertake. It can often make quicker decisions too. Its research funds are larger and free from constant public scrutiny and criticism.

But no private research and sales program may safely ignore or compete with the experiment station kind of agricultural progress, although it often stimulates it and spurs it on. We have many such programs on tap with soils and fertilizers, including grants to worthy students who may through college training become wonder-workers of the future in plant science.

YES, it's a long, interesting old road that leads back there to the days when I helped Dad unload the odoriferous crop stimulant. I do not suppose that an ounce of any of the plant food we added to that sandy soil remains, and probably it's been a constant battle since to keep it up to snuff. Yet I know the fellows who run that farm now have an advantage over us in knowledge, as well as in fewer aching joints and less need to hold their noses.

TIME PROVEN
LaMOTTE SOIL TESTING APPARATUS

LaMotte Soil Testing Service is the direct result of 26 years of extensive cooperative research with agronomists and expert soil technologists to provide simplified soil testing methods. These methods are based on fundamentally sound chemical reactions adapted to the study of soils and have proved to be invaluable aids in diagnosing deficiencies in plant food constituents. These methods are flexible and are capable of application to all types of soil with proper interpretation to compensate for any special soil conditions encountered.

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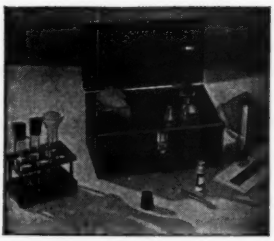

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The following literature on the use of fertilizers in profitable soil and crop management is available for distribution. We shall be glad to send these upon request and in reasonable amounts as long as our supply lasts.

Circulars

Tomatoes (General
Asparagus (General)
Vine Crops (General)
Sweet Potatoes (General)
Better Corn (Midwest) and (Northeast)

Reprints

T-8 A Balanced Fertilizer for Bright Tobacco
N-9 Problems of Feeding Cigarleaf Tobacco
F-3-40 When Fertilizing, Consider Plant-food Content of Crops
S-5-40 What Is the Matter with Your Soil?
K-4-41 The Nutrition of Muck Crops
E-2-42 Fertilizing for More and Better Vegetables
H-12-42 Wartime Contribution of the American Potash Industry
H-2-43 Plant Food for Peach Profits
J-2-43 Maintaining Fertility When Growing Peanuts
Y-5-43 Value & Limitations of Methods of Diagnosing Plant Nutrient Needs
FF-8-43 Potash for Citrus Crops in California
PP-12-43 Commercial Fertilizers for Livestock Farms
A-1-44 What's in That Fertilizer Bag?
H-2-44 Efficient Fertilizers for Potato Farms
X-6-44 Soil Management for Cannery Peas
AA-8-44 Florida Knows How to Fertilize Citrus
CC-8-44 Soil Fertility's Effect on Asparagus
MM-12-44 Blue Lupine Is a Valuable Legume
QQ-12-44 Leaf Analysis—A Guide to Better Crops
C-1-45 Fertilizers for Cotton and Corn Following Lespedeza
G-2-45 Some Whys and Wherefores for Air-Conditioning Soils
K-2-45 Plow-Sole Fertilizing on the Average Farm
P-3-45 Balanced Fertility in the Orchard
Q-3-45 Earliness Counts with Austrian Winter Peas
R-3-45 Higher Corn Yields for North Carolina
V-4-45 Yield and Quality of Cotton Can Be Improved by Boron
W-4-45 Fertilizing Golf Greens
Y-5-45 How Long Do the Effects from Fertilizer Last?
Z-5-45 Alfalfa—the Aristocrat
BB-5-45 Applying Experimental Work to Cotton Farming
DD-5-45 A Case of Combined Potassium and Boron Deficiencies in Grapes
EE-6-45 Balanced Sods in Orchards
FF-6-45 Orcharding from the Ground Up
GG-6-45 Know Your Soil
JJ-8-45 Plow-Under Practices
LL-8-45 Fertilizing for Better Soybeans in North Carolina
MM-8-45 Red Clover Suggests Shortage of Potash
NN-8-45 The Effect of Borax and Lime on Quality of Cauliflowers
OO-8-45 Potash Fertilizers Are Needed on Many Midwestern Farms
PP-10-45 More Vegetables for Less Money
QQ-10-45 A Little Boron Boosts Sweet Potato Yields
SS-10-45 How to Start White Dutch Clover Pastures in Florida
VV-11-45 Borax on Crimson Clover in Tennessee
XX-11-45 Kudzu on Abandoned Land Needs Phosphate and Potash—Maybe Borax
YY-11-45 Potash—In War and Peace
ZZ-11-45 First Things First in Soil Fertility
BBB-12-45 Success with Blueberries
CCC-12-45 Poor Soils—Poor People
A1-46 Crop Production Horizons
B-1-46 Potash Increases Tomato Yield and Quality
C-1-46 A New Machine for Deep Fertilization
D-1-46 A New Legume for the South—Wild Winter Peas
E-1-46 The Sources of Potash for Flue-cured Tobacco
F-1-46 The Fertilizer Rate Problem
H-2-46 Plow-sole Placed Plant Food for Better Crop Production
I-2-46 Boron Deficiency of Lettuce
J-2-46 Correcting Potash Deficiency in Growing Corn
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THE AMERICAN POTASH INSTITUTE

1155 16TH STREET, N. W. WASHINGTON 6, D. C.

Sambo—"I'se jes' been bit by a dog and I'se worried. I hear whenever a dog bites you, whatever the dog has, you get."

Rastus—"Boy, then you has a right to worry."

Sambo—"Why?"

Rastus—"That dog just had eleven pups."

"Who introduced you to your wife?"

"We just met—I don't blame anybody."

A little boy boarded the street car wearing long pants. The conductor charged him full fare. At the next stop a little boy boarded the street car wearing short pants—half fare. Next stop, a young lady entered the street car and the conductor collected no fare.

No! No! She had a transfer.

Minister, at baptism: "What is the baby's name, please?"

Proud father: "Robert William Montgomery Morgan Maxwell."

Minister, to assistant: "More water, please."

"Well, I do say," said the sweet old lady upon tasting her first glass of beer. "It tastes exactly like the medicine my husband has been taking for the last thirty years."

A gal and an automobile are much alike. A good paint job conceals the years, but the lines tell the story.

Marriage is just like sitting in a bath tub. After you get used to it, it ain't so hot.

HOW TO HAVE A FIT

Farmer Squibbs was ploughing the farthest corner of his field when a neighbor came running to call, "Quick, Henry! Your wife's having a fit." Squibbs dropped everything and ran a mile to his house, only to find his wife had recovered fully and was placidly cooking dinner.

A week later he was summoned again. This time, his wife, once more recovered, was darning stockings in the parlor.

A third time the neighbor called for Farmer Squibbs. This time he found his wife out cold on the kitchen floor. He felt her pulse and her heart. Neither stirred. He held a mirror before her mouth. There was no trace of moisture.

Farmer Squibbs straightened himself and mopped his forehead. "Well," he declared, "this is more like it."

FITTER'S FIT

Lady Customer: "I want my shoes comfortable, but they must look stylish, too."

Clerk: "Yes, ma'am. You want them large inside, and small outside, don't you?"

Ah! Those were the days. When you could kiss a girl and taste nothing but the girl!

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BORON IN AGRICULTURE

Authorities have recognized that the depletion of Boron in soil has been reflected in limited production and poor quality of numerous field and fruit crops.

Outstanding results have been obtained with the application of Borax in specific quantities or as part of the regular fertilizer mix, improving the quality and increasing the production of alfalfa and other legumes, table beets, sugar beets, apples, etc.

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Borax is economical and very little is required. It is conveniently packed in 100 lb. sacks and stocks are available for prompt delivery everywhere in the United States and Canada. Address your inquiries to the nearest office.

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SOME FARMS are smaller than a city block. Others cover most of a county. The average U. S. farm is 174 acres. But land measurements are only one factor in determining the size of a farm. A farm is as big as its power to produce.

By increasing your farm's power to produce, V-C Fertilizer makes your farm a bigger and better farm *in yields and profits.*

Another man may own two to three times as many acres as you own. But, if his acres are poorly-fertilized scrub acres and your acres are good land, well-fertilized with V-C Fertilizer, your farm is as big as his *in yields* and your farm is a bigger farm *in profits.*

His costs of production are much greater than yours, because he has to prepare, plant, cultivate and harvest much more land than you do to get the same yield. V-C Fertilizer adds extra yields of better quality crops to your farm, without the work, worry and expense of extra land.

V-C Fertilizer is your best investment. It helps each hour of your work and each acre of your land return a richer harvest. You will never know how really big your farm is *in yields and profits*, until you try using plenty of V-C Fertilizer—the leader in the field since 1895.

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THE PLANT SPEAKS THRU TISSUE TESTS shows the value of tissue testing and the procedure for testing plant tissues in the field. (Running time 14 min. on 400-ft. reel.)

THE PLANT SPEAKS THRU LEAF ANALYSIS evaluates leaves in plant growth and leaf analysis in determining fertilizer needs. (Running time 18 min. on 800-ft. reel.)

We shall be pleased to loan these films to agricultural colleges, experiment stations, county agents, vocational teachers, responsible farm organizations, and members of the fertilizer trade.

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Potash from Soil to Plant (West)
Potash Deficiency in Grapes and Prunes (West)
New Soils from Old (Midwest)
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IMPORTANT

Requests should be made *well in advance* and should include information as to group before which the film is to be shown, date of exhibition (alternative dates if possible), and period of time of loan.

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